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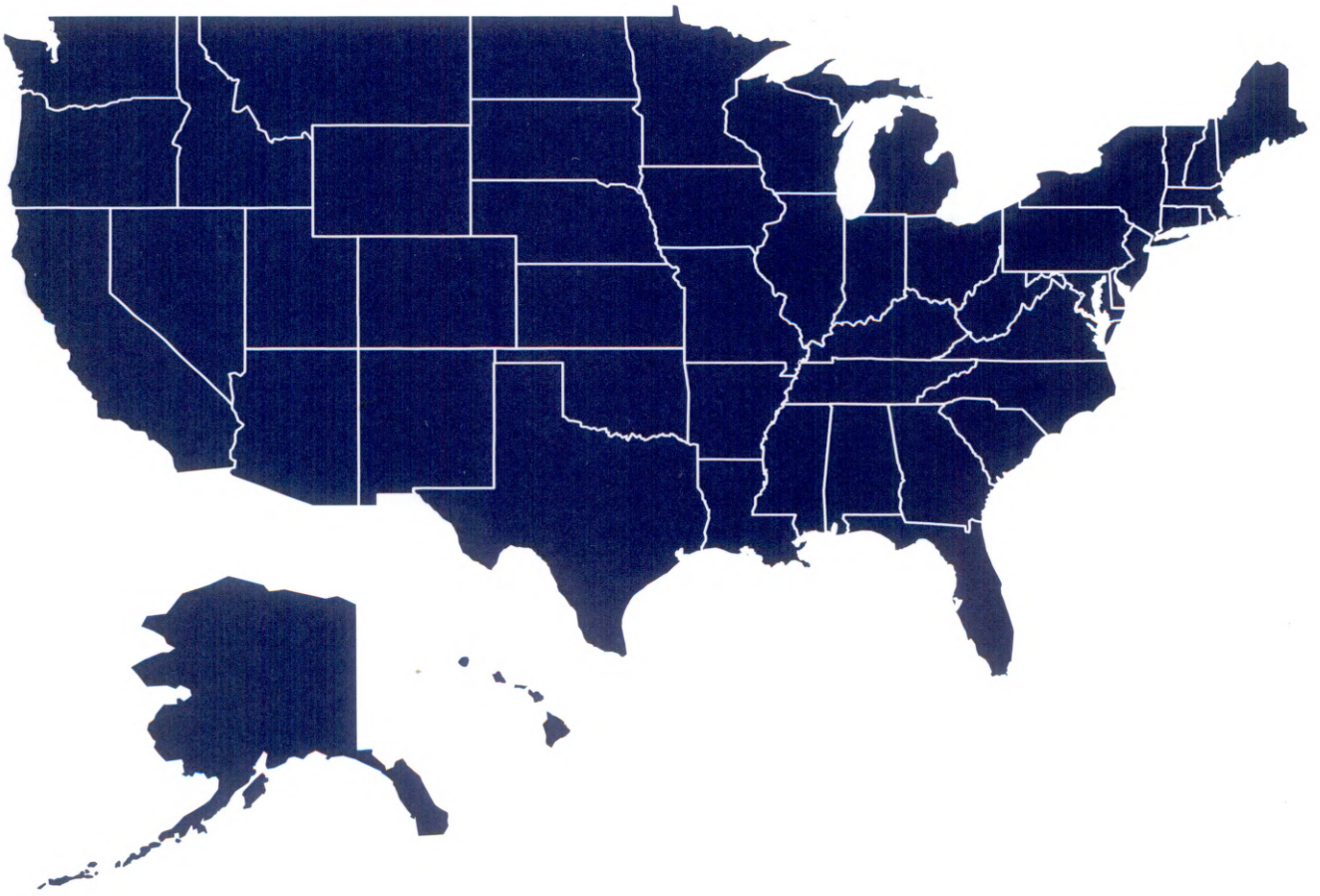
U.S. Department of the Interior
U.S. Geological Survey

MINERALS YEARBOOK 2005

Area Reports: Domestic 2005

Volume II



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MINERALS YEARBOOK

Area Reports: Domestic 2005

Volume II

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U.S. GEOLOGICAL SURVEY
Suzette M. Kimball, Acting Director

UNITED STATES GOVERNMENT PRINTING OFFICE, WASHINGTON: 2009

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Foreword

This edition of the U.S. Geological Survey (USGS) Minerals Yearbook discusses the performance of the worldwide minerals and materials industry during 2005 and provides background information to assist in interpreting that performance. Content of the individual Minerals Yearbook volumes follows:

- Volume I, Metals and Minerals, contains chapters about virtually all metallic and industrial mineral commodities important to the U.S. economy. Chapters on survey methods, summary statistics for domestic nonfuel minerals, and trends in mining and quarrying in the metals and industrial mineral industries in the United States are also included.
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The USGS continually strives to improve the value of its publications to users. Constructive comments and suggestions by readers of the Minerals Yearbook are welcomed.

Suzette M. Kimball, Acting Director

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Acknowledgments

This volume was produced by Arnold O. Tanner, J. Roger Loebenstein,[1] Florence C. Katrivanos, and Gerald R. Smith, Physical Scientists, with the Minerals Information Team of the U.S. Geological Survey (USGS). Domestic nonfuel mineral production data and tables were prepared by Joseph M. Krisanda, Stephen D. Smith, and Christopher H. Lindsay, Industry Data Analysts; crushed stone data and tables were prepared by Susan M. Weaver, Statistical Assistant; and construction sand and gravel data and tables were prepared by Cheryl J. Crawford, Statistical Assistant. The State maps that accompany each State chapter were extensively updated and revised by Robert M. Callaghan, Physical Scientist, in collaboration with State Geological Surveys, State minerals information agencies, USGS mineral commodity specialists, and various other Federal Government agencies. All mineral commodity rankings and statistical analyses were performed by Mr. Tanner and were based upon data reported to the USGS by companies responding to the annual canvasses of nonfuel mineral producers in the United States. For crushed stone and construction sand and gravel, each State chapter includes tabular 2003-05 data in more detail (kind of stone, use, aggregate district, and so forth), where applicable. Compilations of data contained in this volume were largely based on statistics and other data provided by the mineral industries. The USGS gratefully acknowledges the willing contribution of these essential data by both companies and individuals. Information regarding a State's mining industry, mineral exploration, and other mining-related activities or legislation was derived from information submitted by officials from each participating State. We thank those State agencies that contributed mining and minerals industry information for their States. Their submissions significantly broadened the scope of those chapters; their participation in this joint project is greatly appreciated. Authors of text submissions from participating States are referenced by footnote in each chapter, as appropriate. All chapters underwent technical review by USGS mineral commodity specialists and other agency professionals. The melding of their knowledge and expertise into this project was invaluable in producing accurate individual documents and is greatly appreciated. Maps indicating "major producing areas" lead off each respective chapter; a chapter is included that lists with meanings the mineral symbols used in this volume.

In the collection of statistical and other mineral industry information, the USGS also was assisted by various State agencies through cooperative memoranda of understanding (MOUs). Some of the chapters in this publication were reviewed by staff members of these State agencies. Our sincere appreciation for all agency cooperation is extended to each State and Commonwealth government agency that has an MOU with the USGS. These are as follows:

Alabama: Geological Survey of Alabama.
Arizona: Arizona Department of Mines and Mineral Resources.
Arkansas: Arkansas Geological Commission.
California: California Geological Survey.
Colorado: Colorado Geological Survey.
Connecticut: Connecticut Geological and Natural History Survey.
Delaware: Delaware Geological Survey.
Florida: Florida Geological Survey.
Georgia: Georgia Department of Natural Resources, Georgia Geologic Survey.
Hawaii: Hawaii Department of Land and Natural Resources, Commission of Water Resources Management.
Idaho: Idaho Geological Survey.
Illinois: Illinois State Geological Survey.
Indiana: Indiana Geological Survey.
Iowa: Iowa Geological Survey and Land Quality Bureau.
Kansas: Kansas Geological Survey.
Kentucky: Kentucky Geological Survey.
Louisiana: Louisiana Geological Survey.
Maine: Maine Geological Survey.
Maryland: Maryland Department of the Environment, Minerals, Oil, and Gas Division.
Michigan: Michigan Department of Environmental Quality, Office of Geological Survey.
Mississippi: Mississippi Department of Environmental Quality, Office of Geology.
Missouri: Missouri Department of Natural Resources, Division of Geology and Land Survey.
Montana: Montana Bureau of Mines and Geology.
Nebraska: University of Nebraska-Lincoln, Nebraska Conservation and Survey Division.
Nevada: Nevada Bureau of Mines and Geology.
New Hampshire: New Hampshire Geological Survey.
New Jersey: New Jersey Geological Survey.

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New Mexico: New Mexico Bureau of Geology and Mineral Resources.
New York: New York State Geological Survey.
North Carolina: North Carolina Geological Survey.
North Dakota: North Dakota Geological Survey.
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Oklahoma: Oklahoma Geological Survey.
Pennsylvania: Pennsylvania Bureau of Topographic and Geologic Survey.
Puerto Rico: Puerto Rico Department of Natural and Environmental Resources, Division of Geology.
South Carolina: South Carolina Geological Survey.
South Dakota: South Dakota Geological Survey.
Tennessee: Tennessee Department of Environment and Conservation, Division of Geology.
Texas: The University of Texas at Austin, Bureau of Economic Geology.
Utah: Utah Geological Survey.
Vermont: Vermont Geological Survey.
Virginia: Virginia Department of Mines, Minerals and Energy.
West Virginia: West Virginia Geological and Economic Survey.
Wisconsin: Wisconsin Geological and Natural History Survey.
Wyoming: Wyoming State Geological Survey.

John H. DeYoung, Jr.
Chief Scientist, Minerals Information Team

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Contents

Foreword, by Suzette M. Kimball, Acting Director iii
Contacts iv
Acknowledgments, by John H. DeYoung, Jr. v
Survey Methods for Nonfuel Minerals, by Jeffrey P. Busse 1.1
Statistical Summary, by Stephen D. Smith and Christopher H. Lindsay 2.1
The Mineral Industry of—
- Alabama 3.1
- Alaska 4.1
- Arizona 5.1
- Arkansas 6.1
- California 7.1
- Colorado 8.1
- Connecticut 9.1
- Delaware 10.1
- Florida 11.1
- Georgia 12.1
- Hawaii 13.1
- Idaho 14.1
- Illinois 15.1
- Indiana 16.1
- Iowa 17.1
- Kansas 18.1
- Kentucky 19.1
- Louisiana 20.1
- Maine 21.1
- Maryland 22.1
- Massachusetts 23.1
- Michigan 24.1
- Minnesota 25.1
- Mississippi 26.1
- Missouri 27.1
- Montana 28.1
- Nebraska 29.1
- Nevada 30.1
- New Hampshire 31.1
- New Jersey 32.1
- New Mexico 33.1
- New York 34.1
- North Carolina 35.1
- North Dakota 36.1
- Ohio 37.1
- Oklahoma 38.1
- Oregon 39.1
- Pennsylvania 40.1
- Puerto Rico 41.1
- Rhode Island 42.1
- South Carolina 43.1
- South Dakota 44.1
- Tennessee 45.1
- Texas 46.1
- Utah 47.1
- Vermont 48.1
- Virginia 49.1
- Washington 50.1
- West Virginia 51.1
- Wisconsin 52.1
- Wyoming 53.1

Map Mineral Symbols 54.1
Directory of State Geologists and Primary State Minerals Information Personnel 55.1

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- Arkansas 6.1
- California 7.1
- Colorado 8.1
- Connecticut 9.1
- Delaware 10.1
- Florida 11.1
- Georgia 12.1
- Hawaii 13.1
- Idaho 14.1
- Illinois 15.1
- Indiana 16.1
- Iowa 17.1
- Kansas 18.1
- Kentucky 19.1
- Louisiana 20.1
- Maine 21.1
- Maryland 22.1
- Massachusetts 23.1
- Michigan 24.1
- Minnesota 25.1
- Mississippi 26.1
- Missouri 27.1
- Montana 28.1
- Nebraska 29.1
- Nevada 30.1
- New Hampshire 31.1
- New Jersey 32.1
- New Mexico 33.1
- New York 34.1
- North Carolina 35.1
- North Dakota 36.1
- Ohio 37.1
- Oklahoma 38.1
- Oregon 39.1
- Pennsylvania 40.1
- Puerto Rico 41.1
- Rhode Island 42.1
- South Carolina 43.1
- South Dakota 44.1
- Tennessee 45.1
- Texas 46.1
- Utah 47.1
- Vermont 48.1
- Virginia 49.1
- Washington 50.1
- West Virginia 51.1
- Wisconsin 52.1
- Wyoming 53.1

Map Mineral Symbols 54.1
Directory of State Geologists and Primary State Minerals Information Personnel 55.1

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Survey Methods for Nonfuel Minerals

By Jeffrey P. Busse

The U.S. Geological Survey (USGS) collects worldwide data on virtually every commercially important nonfuel mineral commodity. These data form the basis for tracking and assessing the health of the minerals sector of the U.S. economy.

The USGS data collection activity was instituted by the 47th Congress in the appropriations act of August 7, 1882 (22 Stat. 329), which placed the collection of mineral statistics on an annual basis. The most recent authority for the USGS survey activity is the National Materials and Minerals Policy, Research and Development Act of 1980 (Public Law 96-479, 94 Stat. 2305). The Act included provisions to strengthen protection for proprietary data provided to the U.S. Department of the Interior by persons or firms engaged in any phase of mineral or mineral-material production or consumption.

Data Collection Surveys

The USGS begins the collection of domestic nonfuel minerals and materials statistics by appraising the information requirements of Government and private organizations of the United States. Requirements that can be met by collecting data from minerals establishments are posed as questions on USGS surveys. Figure 1 shows a typical survey form.

Specific questions about mineral commodity activities, such as production, consumption, and shipments, are structured in the survey forms to provide meaningful aggregated data. Thus, the entire mineral economic cycle from production through consumption is covered by 140 monthly, quarterly, semiannual, and annual surveys.

After the survey form has been designed, a list of the appropriate establishments to be canvassed is developed. Many sources are used to determine which companies, mines, plants, and other operations are expected to be included on the survey mailing list. State geologists, Federal organizations (such as the Mine Safety and Health Administration), trade associations, industry representatives, and trade publications and directories are some of the sources that are used to develop and update survey listings. With few exceptions, a complete canvass of the list of establishments is used rather than a sample survey. The iron and steel scrap and pig iron canvass is one of the exceptions where a sample survey is conducted.

The Paperwork Reduction Act requires that any Government agency that wants to collect information from 10 or more individuals or establishments must first obtain approval from the Office of Management and Budget (OMB), which approves the need to collect the data and protects industry from unwarranted Government paperwork. This approval is indicated by the OMB Control Number on the survey forms (figure 1).

Survey Processing

The USGS surveys approximately 20,000 establishments. Each year, the USGS mails about 34,000 forms for 140 different surveys. Each completed survey form returned to the USGS undergoes extensive analysis, including computerized checks, to ensure the highest possible accuracy of the mineral data. The statistical staff monitors all surveys to ensure that errors are not created by reporting in physical units different from the units requested on the form. Relations between associated measures, such as produced crude ore and marketable crude ore, are analyzed for consistency. Engineering variables, such as recovery factors from ores and concentrates, also are used. The totals for each form are verified, and currently reported data are checked against prior reports to detect possible errors or omissions.

The USGS is also developing an Internet-based electronic forms system as required by the Government Paperwork Elimination Act (GPEA). This electronic system is designed to speed the collection and analysis of minerals information. As of December 2005, 25 canvass forms, accounting for 81% of annual responses covered by GPEA, are available electronically.

Survey Responses.—To enable the reader to better understand the basis on which the statistics are calculated, each mineral commodity chapter includes a section about domestic data coverage. This section briefly describes the data sources, the number of establishments surveyed, the response percentage, and the method of estimating the production or consumption for nonrespondents.

To produce reliable aggregated data, the USGS uses efficient procedures for handling instances of nonresponse. Failure to respond to the initial survey form results in a second request, either a second mailing of the paper form or an e-mail in the case of electronic respondents. If the second request does not produce a response, then telephone calls are made to the nonrespondents. The followup calls provide the necessary data to complete the survey forms and/or to verify questionable data entries. Periodic visits to mineral establishments also are made by USGS mineral commodity specialists to gather missing data and to explain the importance of the establishment's reporting. By describing the use of the published statistics and showing the impact of nonresponse, the USGS strives to encourage respondents to give complete and accurate replies.

The OMB publication "Guidelines for Reducing Reporting Burden" stipulates that the minimum acceptable response rate is 75% of the panel surveyed. In addition, the USGS strives for a minimum reporting level of 75% of the quantity produced or consumed (depending on the survey) for certain key statistics. Response rates are periodically reviewed. For those surveys that do not meet the minimum reporting level, procedures are developed and implemented to improve response rates.

Estimation for Nonresponse.—When efforts to obtain a response to a survey fail, estimation or imputation techniques must be used to account for missing data. Some of the estimation methods depend on knowledge of prior establishment reporting; other techniques rely on external information to estimate the missing data. When survey forms are received

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after the current publication has been completed, the forms are reviewed, necessary imputations are made for missing data, and the survey database is updated. The revised data are reported in later publications.

Protection of Proprietary Data.—The USGS relies on the cooperation of the U.S. minerals industry to provide the mineral data that are presented in this and other USGS minerals information publications. Without a strong response to survey requests, the USGS would not be able to present reliable statistics. The USGS, in turn, respects the proprietary nature of the data received from the individual companies and establishments. To ensure that proprietary rights will not be violated, the USGS analyzes each of the aggregated statistics to determine if the data reported by an individual establishment can be deduced from the aggregated statistics. If, for example, there are only two significant producers of a mineral commodity in a given State, then the USGS will not publish the State total because either producer could readily estimate the production of the other. It is this obligation to protect proprietary information that results in the withheld, or W, entries in the published tables. If a company gives permission in writing, however, then the USGS will publish the data as long as the data from other respondents are protected from disclosure.

International Data

International data are collected by USGS country specialists and international data coordinators. The data are gathered from various sources, which include published reports of foreign Government mineral and statistical agencies, international organizations, the U.S. Department of State, the United Nations, the Organization of the Petroleum Exporting Countries, and personal contact by specialists traveling abroad. Each February, minerals questionnaires are sent to foreign organizations requesting estimates of mineral production for the country for the preceding year. Missing data are estimated by USGS country specialists on the basis of historical trends and the specialist's knowledge of current production capabilities in each country.

Publications

The USGS disseminates current and historical minerals information through printed publications and its Web site.

Printed Publications.—The Minerals Yearbook summarizes annually, on a calendar-year basis, the significant economic and technical developments in the mineral industries. Three volumes are issued each year—volume I, Metals and Minerals; volume II, Area Reports: Domestic; and volume III, Area Reports: International. Volume I presents, by mineral commodity, salient statistics on production, trade, consumption, reserves, and other measures of economic activity. Volume II reviews the U.S. minerals industry by State and island possessions. Volume III is published as four separate regional reports that cover more than 175 foreign countries. These reports contain individual country chapters that examine the mining, refining, processing, and use of minerals in each country in the region and how they relate to U.S. industry.

The Mineral Commodity Summaries (MCS), which is an up-to-date summary of about 80 nonfuel mineral commodities, is the earliest Government publication to furnish estimates that cover the previous year's nonfuel mineral industry data. It contains information on the domestic industry structure, Government programs, tariffs, 5-year salient domestic statistics, and a summary of significant events, trends, and issues in the international minerals industry during the past year.

The Minerals Yearbook and the MCS may be purchased from the U.S. Government Printing Office, Superintendent of Documents, P.O. Box 371954, Pittsburgh, PA 15250; telephone, (202) 512-1800 or (866) 512-1800 (toll-free); Internet, http://bookstore.gpo.gov.

Electronic Publications.—Current and historical minerals information is available through the USGS Web site at URL http://minerals.usgs.gov/minerals. The Web site provides USGS minerals information products to view or download, as well as USGS contacts for minerals information and links to other mineral-related sites on the Internet.

Mineral Industry Surveys (MIS) contain timely statistical and economic data on minerals. The surveys are designed to keep Government agencies and the public, particularly the mineral industry and the business community, informed of trends in the production, distribution, inventories, and consumption of minerals. Frequency of issue depends on the demand for current data. MIS are released monthly, quarterly, semiannually, or annually.

Metal Industry Indicators, which is published monthly, contains indexes that measure the current and future performance of three U.S. metal industries. For each of the three industries, a composite coincident index and a composite leading index have been developed based on procedures and data similar to those used to construct the Conference Board's coincident and leading cyclical indexes for the national economy. Nonmetallic Mineral Products Industry Indexes, also published monthly, contains leading and coincident indexes which measure the current and future performance of the industrial minerals industry. The indexes were designed by using the same procedures as the USGS metal composite indexes.

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FIGURE 1
A TYPICAL SURVEY FORM

USGS Form 9-4045-M
Fer. (rev. 2/18/2005)

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Public voluntary reporting burden for this collection of information is estimated to average 30 MINUTES per response. A Federal agency may not conduct or sponsor, and a person is not required to respond to a collection of information unless it displays a valid OMB control number. Comments regarding this collection of information should be directed to: U.S. Geological Survey, Statistics and Information Systems Section, 988 National Center, Reston, VA 20192. **Please do not mail survey forms to this address.**

Collection of nonfuel minerals information is authorized by Public Law 96-479 and the Defense Production Act. This information is used to support executive policy decisions pertaining to emergency preparedness, national defense, and analyses for minerals legislation and industrial trends. The USGS relies on your voluntary and timely response to assure that its information is complete and accurate.

Please return this form in the enclosed envelope or fax to the above toll-free number by the **15TH OF THE MONTH** following the reporting period. Complete a separate form for each mineral establishment that was active during the reporting period. A minerals establishment is defined as a single physical location where mineral operations are conducted; for example, a mine only, a mine and preparation plant, or a preparation plant only. If you do not have exact data, please enter your best estimates and mark with an /e. Use zero (0) when appropriate. Do not report decimals or fractions. Round to the nearest whole number. If you have nothing to report, please complete Section 1, sign, and return the form. Please use the space for "Remarks" to provide any specific information that will help us in the use or interpretation of the data. Any statement on the effect of changes in economic conditions upon the reporting establishment will be useful. Additional forms are available upon request.

If you have any questions concerning completion of this form, please contact the Mineral Commodities Data Unit, U.S. Geological Survey, 985 National Center, Reston, VA 20192, Telephone (703) 648-7960.

SECTION 1. Mine or group covered by this report.

Name _____ State _____ County _____

SECTION 2. Stocks, production, and shipments of usable ore for the report month.
Report only ore products as shipped to consumer, such as direct-shipping ore, concentrate, or agglomerates.
Report ores produced in the United States only; do not include imports.

Usable ore (1)	Code	Weight unit Mark (X) one (2) Long tons (4)	Weight unit Mark (X) one (2) Metric tons (6)	Physical inventory Adjustment only (3)	Beginning stocks (4)	Production (5)	Shipments (6)	Ending stocks (7)
Iron ore (containing less that 5% Mn, natural.....	201							

SECTION 3. Please indicate any mines opened or closed by your company during the month.

Remarks:

Name of person to be contacted regarding this report			Tel. area code	No.	Ext.
Address	No.	Street	City	State	ZIP Code

May tabulations be published which could indirectly reveal the data reported above? ☐ (1) Yes ☐ (2) No

Signature	Title	Date

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Statistical Summary

By Stephen D. Smith and Christopher H. Lindsay

This annual report summarizes data on crude nonfuel mineral production[1] for the United States, its island possessions, and the Commonwealth of Puerto Rico.

Although crude mineral production may be measured at any of several stages of extraction and processing, the stage of measurement used in this annual report is what is termed "mine output." This term refers to minerals or ores in the form in which they are first extracted from the ground, but customarily may include the output from auxiliary processing at or near the mines.

Because of inadequacies in the statistics available, some series deviate from the foregoing definition. For copper, gold, lead, silver, and zinc, the quantities listed are recorded on a mine basis (as the recoverable content of ore sold or treated). The values assigned to the quantities, however, are based on the average selling price of refined metal, not the mine value.

The total value of all nonfuel mineral production in the United States in 2005 increased to $55.2 billion, which was an increase of almost 22% compared with that of 2004; metals increased to $16.5 billion, which was an increase of more than 32%; and industrial minerals increased to $38.7 billion, more than 17%.

In 2005, the value of nonfuel mineral commodity production for the following 11 commodities, in descending order of production value, was greater than $1 billion: stone (crushed), cement (portland), sand and gravel (construction), copper, gold, molybdenum concentrates, iron ore (usable shipped), lime, salt, phosphate rock, and zinc. They accounted for more than 85% of the U.S. total production value (table 1).

In 2005, the value of nonfuel mineral commodity production in the following 20 States, in descending order of production value, was greater than $1 billion: Arizona, California, Nevada, Florida, Utah, Texas, Minnesota, Missouri, Georgia, Colorado, Michigan, Pennsylvania, Alaska, Wyoming, New York, Illinois, Ohio, Virginia, New Mexico, and Alabama. They accounted for more than 75% of the U.S. total production value (table 3).

[1]The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2005 U.S. Geological Survey (USGS) mineral production data published in this chapter are as of March 2007. For some mineral commodities, such as construction sand and gravel, crushed stone, and portland cement, estimates are updated periodically. To obtain the most current information, please contact the appropriate USGS mineral commodity specialist. Specialist contact information are available on the Internet at http://minerals.usgs.gov/minerals/contacts/comdir.html; alternatively, specialists' names and telephone numbers may be obtained by calling USGS information at (703) 648-4000 or by calling the USGS Earth Science Information Center at 1-888-ASK-USGS (275-8747). All Mineral Industry Surveys—mineral commodity, State, and country—are also available on the Internet at http://minerals.usgs.gov/minerals.

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TABLE 1
NONFUEL MINERAL PRODUCTION IN THE UNITED STATES[1, 2]

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral		2003		2004		2005	
		Quantity	Value	Quantity	Value	Quantity	Value
Metals:							
Beryllium concentrates	metric tons	2,100	NA	2,210	NA	2,780	NA
Copper[3]		1,120	2,100,000	1,160	3,420,000	1,140	4,360,000
Gold[3]	kilograms	277,000	3,250,000	258,000	3,400,000	256,000	3,670,000
Iron ore, usable shipped		46,100	1,490,000	54,900	2,080,000	53,200	2,370,000
Iron oxide pigments, crude	metric tons	50,900	814	(4)	W	(4)	795
Lead[3]	do.	449,000	433,000	430,000	523,000	426,000	574,000
Molybdenum concentrates[5, 6]	do.	33,600	324,000	42,000	1,420,000	58,000	3,660,000
Palladium[5]	kilograms	14,000	91,400	13,700	102,000	13,300	87,100
Platinum[5]	do.	4,170	93,100	4,040	110,000	3,920	113,000
Silver[3]	do.	1,240,000	196,000	1,250,000	268,000	1,230,000	289,000
Zinc[3]	metric tons	738,000	661,000	715,000	827,000	720,000	1,070,000
Combined value of cadmium byproduct in zinc concentrates, magnesium metal, titanium concentrates, zirconium concentrates, and value indicated by symbol W		XX	233,000	XX	304,000	XX	316,000
Total		XX	8,870,000	XX	12,500,000	XX	16,500,000
Industrial minerals, excluding fuels:							
Barite		468	13,900	532	18,700	489	17,600
Boron		1,150	591,000	1,210	626,000	1,150	713,000
Bromine	metric tons	216,000	155,000	222,000	191,000	226,000	168,000
Cement:							
Masonry		4,740	468,000 e	5,000	585,000 e	5,420	679,000 e
Portland		88,100	6,460,000 e	92,400	7,110,000 e	93,900	8,360,000 e
Clays:							
Ball		1,310	56,200	1,220	54,100	1,210	52,900
Bentonite		3,940	177,000	4,060	179,000	4,710	215,000
Common		23,100	131,000	24,600	157,000	24,300	176,000
Fire		400	10,200	256	7,870	353	10,700
Fuller's earth[7]		3,610	332,000	3,260	329,000	2,990	339,000
Kaolin		7,680	939,000	7,760	945,000	7,800	860,000
Diatomite		599	159,000	620	177,000	653	179,000
Feldspar		800	43,400	770	44,200	750	43,000
Garnet, industrial	metric tons	29,200	3,170	28,400	3,050	440,000	3,840
Gemstones, natural		NA	12,500	NA	14,500	NA	13,400
Gypsum, crude		16,700	114,000	17,200	124,000	21,100	158,000
Helium:							
Crude	million cubic meters	49	67,000	57	77,500	42	63,300
Grade-A	do.	122	282,000	130	299,000	133	336,000
Iodine	metric tons	1,090	15,900	1,130	W	1,570	W
Kyanite[e]		90	13,400	90	13,400	90	13,400
Lime		(4)	W	20,000	1,370,000	20,000	1,500,000
Mica, crude		79	16,700	99,200	15,400	78,100	19,600
Peat[8]		632	18,800	741 r	21,200	751	20,800
Perlite, crude	metric tons	493,000	18,800	508,000	20,600	508,000	20,700
Phosphate rock, marketable		35,000	946,000	35,800	995,000	36,100	1,070,000
Potash		2,500	280,000	2,700	340,000	2,500	410,000
Pumice and pumicite	metric tons	870,000	21,900	1,490,000	25,000	1,270,000	39,300
Salt		41,100	1,130,000	45,000	1,270,000	45,000	1,310,000
Sand and gravel:							
Construction		1,160,000	5,990,000	1,240,000	6,590,000	1,270,000	7,460,000
Industrial		27,500	609,000	29,700	685,000	30,600	752,000
Silica stone[9]	metric tons	513	3,630	655	3,660	576	2,290
Soda ash		10,600	765,000	11,000	770,000	11,000	968,000
Stone, crushed[10]		1,530,000	9,060,000	1,440,000 r	9,320,000 r	1,690,000	12,100,000
Tripoli	metric tons	68,800	17,700	94,000	19,400	91,100	18,700
Zeolites	do.	(4)	NA	(4)	W	(4)	W

See footnotes at end of table.

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TABLE 1—Continued
NONFUEL MINERAL PRODUCTION IN THE UNITED STATES[1, 2]

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral	2003		2004		2005	
	Quantity	Value	Quantity	Value	Quantity	Value
Industrial minerals, excluding fuels—Continued:						
Combined value of brucite, greensand marl, lithium carbonate, magnesite, magnesium compounds, olivine, pyrophyllite (crude), staurolite, stone (dimension), talc (crude), vermiculite (crude), wollastonite, and values indicated by symbol W	XX	1,800,000	XX	531,000	XX	555,000
Total	XX	30,700,000	XX	32,900,000 r	XX	38,700,000
Grand total	XX	39,600,000	XX	45,400,000 r	XX	55,200,000

[e]Estimated. [r]Revised. NA Not available. W Withheld to avoid disclosing company proprietary data; value included with "Combined value." XX Not applicable.

[1]Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

[2]Data are rounded to three significant digits; may not add to totals shown.

[3]Recoverable content of ores, etc.

[4]Withheld to avoid disclosing company proprietary data.

[5]Content of ore and concentrate.

[6]Shipments.

[7]Sales.

[8]Excludes attapulgite.

[9]Includes grindstones, pulpstones, and sharpening stones; excludes mill liners and grinding pebbles

[10]Excludes abrasive stone and bituminous limestone and sandstone; all included elsewhere in table.

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TABLE 2
NONFUEL MINERALS PRODUCED IN THE UNITED STATES, BY COMMODITY AND STATES IN 2005

(Principal States based on quantity unless otherwise noted)

Mineral	Principal States	Other States (alphabetical order)
Barite	NV and GA	
Beryllium concentrates	UT	
Boron	CA	
Bromine	AR and MI	
Brucite	TX	
Cadmium byproduct in zinc concentrates	AK, WA, MO, MT, ID	
Cement:		
Masonry	FL, CA, SC, AL, IN	AR, AZ, CO, GA, IA, KS, KY, MD, MI, MO, MT, NE, NM, NY, OH, OK, PA, TN, TX, VA, WV.
Portland	CA, TX, PA, FL, MI	All other States, except AK, CT, DE, HI, LA, MA, MN, NH, NJ, NC, ND, RI, VT.
Clays:		
Ball	TN, TX, MS, KY, IN	
Bentonite	WY, MS, MT, AL, UT	AZ, CA, CO, NV, OR, TX, VA.
Common	TX, AL, NC, GA, OH	All other States, except AK, DE, HI, ID, NV, NH, RI, VT, WI.
Fire	MO, OH, SC	
Fuller's earth	GA, MO, MS, VA, FL	CA, IL, KS, NV, TN, TX.
Kaolin	GA, SC, AL, AR, CA	FL, NV, NC, TN, TX.
Copper[1]	AZ, UT, NM, NV, MT	ID and MO.
Diatomite	CA, NV, OR, WA	
Feldspar	NC, VA, CA, OK, GA	ID and SD.
Garnet, industrial	NY, ID, MT	
Gemstones, natural[2]	TN, AZ, OR, CA, AR	All other States.
Gold[1]	NV, UT, AK, CO, MT	AZ, CA, ID, MT, NM, SD, WA.
Greensand marl	NJ	
G rysum, crude	OK, IA, NV, NY, CA	AR, AZ, CO, IN, KS, LA, MI, NM, SD, TX, UT, WY.
Helium:		
Crude	KS and TX	
Grade-A	KS, WY, OK, CO, UT	TX.
Iodine, crude	OK	
Iron ore, usable	MN, MI, CA	
Iron oxide pigments, crude	GA, MI, AL, VA	
Kyanite	VA	
Lead[1]	MO, AK, ID, WA, MT	
Lime	MO, KY, AL, OH, TX	All other States, excp t AK, CT, DE, HI, KS, ME, MD, MS, NH, NJ, NY, NC, RI, SC, VT.
Lithium carbonate	NV	
Ma nesite	NV	
Magnesium compounds	MI, UT, FL, DE, CA	
Ma nesium metal	UT	
Mica, crude	NC, AL, SD, SC, GA	
Mol bdenum, concentrates	UT, CO, AZ, ID, MT	NM. p
Olivine	WA and NC	
Palladium[1]	MT	
Peat	FL, MI, MN, IL, IN	IA, ME, MT, NJ, NY, OH, PA, WA, WV, WI.
Perlite, crude	NM, OR, AZ, UT, CA	ID and NV.
Phosp hate rock	FL, NC, ID, UT	
Platinum[1]	MT	
Potash	NM, UT, MI	
Pumice and umicite	AZ, OR, CA, NM, ID	KS.
Pyrophyllite, crude	NC	
Salt	LA, TX, NY, OH, KS	AL, AZ, CA, MI, NV, NM, OK, TN, UT, WV.
Sand and gravel:		
Construction	CA, AZ, TX, MI, MN	All other States.
Industrial	IL, TX, WI, CA, NJ	All other States, except AK, CT, DE, HI, KY, ME, MA, MT, NE, NH, NY, OR, SD, UT, VT, WY.
Silica stone[3]	AR	
Silver[1]	AK, NV, ID, UT, MT	AZ, CA, CO, MO, NM, WA.
Soda ash	WY and CA	
Staurolite	FL	

See footnotes at end of table.

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TABLE 2—Continued
NONFUEL MINERALS PRODUCED IN THE UNITED STATES, BY COMMODITY AND STATES IN 2005

(Principal States based upon quantity unless otherwise noted)

Mineral	Principal States	Other States (alphabetical order)
Stone:		
Crushed	TX, FL, PA, MO, VA	All other States, except DE.
Dimension	WI, GA, IN, VT, MA	All other States, except AK, DE, FL, HI, IA, KY, LA, MS, NE, NV, NJ, ND, OR, RI, WY.
Talc, crude	MT, TX, VT, NY, VA	OR.
Titanium concentrates:		
Ilmenite	FL, VA, GA	
Rutile	FL	
Tripoli	IL, OK, AR, PA	
Vermiculite, crude	SC and VA	
Wollastonite	NY	
Zeolites	NM, ID, TX, AZ, NV	CA and WY.
Zinc[1]	AK, WA, MO, MT, ID	
Zirconium concentrates	FL, VA, GA	

[1]Content of ores, etc.
[2]Principal producing States based on value.
[3]Grindstones, pulpstones, and sharpening stones; excludes mill liners and grinding pebbles.

TABLE 3
VALUE OF NONFUEL MINERAL PRODUCTION IN THE UNITED STATES AND PRINCIPAL NONFUEL MINERALS PRODUCED IN 2005[1]

State	Value (thousands)	Rank	Percentage of U.S. total	Principal minerals, in order of value
Alabama	$1,120,000	20	2.03	Cement (portland), stone (crushed), lime, sand and gravel (construction), cement (masonry).
Alaska	1,470,000	13	2.66	Zinc, lead, gold, silver, sand and gravel (construction).
Arizona	4,350,000	1	7.88	Copper, molybdenum concentrates, sand and gravel (construction), cement (portland), stone (crushed).
Arkansas	591,000	32	1.07	Stone (crushed), bromine, cement (portland), sand and gravel (construction), lime.
California	4,240,000	2	7.68	Sand and gravel (construction), cement (portland), boron minerals, stone (crushed), soda ash.
Colorado	1,750,000	10	3.17	Molybdenum concentrates, sand and gravel (construction), cement (portland), gold, stone (crushed).
Connecticut[2]	157,000	42	0.28	Stone (crushed), sand and gravel (construction), stone (dimension), clays (common), gemstones (natural).
Delaware[2]	20,000	50	0.04	Sand and gravel (construction), magnesium compounds, stone (crushed), gemstones (natural).
Florida	2,890,000	4	5.24	Stone (crushed), phosphate rock, cement (portland), sand and gravel (construction), cement (masonry).
Georgia	1,810,000	9	3.28	Clays (kaolin), stone (crushed), clays (fuller's earth), sand and gravel (construction), cement (portland).
Hawaii	100,000	45	0.18	Stone (crushed), sand and gravel (construction), gemstones (natural).
Idaho	906,000	21	1.64	Molybdenum (concentrates), phosphate rock, sand and gravel (construction), silver, cement (portland).
Illinois	1,210,000	16	2.19	Stone (crushed), cement (portland), sand and gravel (construction), sand and gravel (industrial), clays (fuller's earth).
Indiana	883,000	22	1.60	Stone (crushed), cement (portland), sand and gravel (construction), lime, cement (masonry)
Iowa	641,000	29	1.16	Cement (portland), stone (crushed), sand and gravel (construction), gypsum (crude), lime
Kansas	870,000	23	1.58	Cement (portland), helium (Grade-A), stone (crushed), salt, helium (crude).
Kentucky	765,000	27	1.39	Stone (crushed), lime, cement (portland), sand and gravel (construction), stone (crushed).
Louisiana	393,000	36	0.71	Salt, sand and gravel (construction), stone (crushed), clays (common), sand and gravel (industrial).
Maine	141,000	43	0.26	Sand and gravel (construction), cement (portland), stone (crushed), stone (dimension), peat
Maryland[2]	577,000	33	1.05	Stone (crushed), cement (portland), sand and gravel (construction), cement (masonry), stone (dimension).
Massachusetts[2]	250,000	38	0.45	Stone (crushed), sand and gravel (construction), lime, stone (dimension), clays (common).
Michigan	1,750,000	11	3.17	Iron ore (usable shipped), cement (portland), sand and gravel (construction), stone (crushed), salt.
Minnesota[2]	2,190,000	7	3.97	Iron ore (usable shipped), sand and gravel (construction), stone (crushed), sand and gravel (industrial), stone (dimension).
Mississippi	215,000	40	0.39	Sand and gravel (construction), stone (crushed), cement (portland), clays (fuller's earth), clays (bentonite).
Missouri	1,940,000	8	3.51	Stone (crushed), cement (portland), lead, lime, sand and gravel (construction).
Montana	847,000	24	1.53	Molybdenum (concentrates), copper, platinum metal, palladium metal, sand and gravel (construction).
Nebraska[2]	110,000	44	0.20	Cement (portland), sand and gravel (construction), stone (crushed), lime, clays (common).
Nevada	3,880,000	3	7.03	Gold, sand and gravel (construction), copper, lime, stone (crushed).
New Hampshire[2]	88,200	47	0.16	Sand and gravel (construction), stone (crushed), stone (dimension), gemstones (natural).

See footnotes at end of table.

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TABLE 3—Continued

VALUE OF NONFUEL MINERAL PRODUCTION IN THE UNITED STATES AND PRINCIPAL NONFUEL MINERALS PRODUCED IN 2005[1]

State	Value (thousands)	Rank	Percentage of U.S. total	Principal minerals, in order of value
New Jersey[2]	344,000	37	0.62	Stone (crushed), sand and gravel (construction), sand and gravel (industrial), greensand marl, peat.
New Mexico	1,150,000	19	2.08	Copper, potash, molybdenum (concentrates), sand and gravel (construction), cement (portland)
New York	1,290,000	15	2.34	Stone (crushed), salt, cement (portland), sand and gravel (construction), wollastonite.
North Carolina[2]	792,000	25	1.43	Stone (crushed), phosphate rock, sand and gravel (construction), sand and gravel (industrial), feldspar.
North Dakota	45,600	48	0.08	Sand and gravel (construction), lime, stone (crushed), clays (common), sand and gravel (industrial).
Ohio	1,210,000	17	2.19	Stone (crushed), sand and gravel (construction), salt, lime, cement (portland).
Oklahoma	606,000	31	1.10	Stone (crushed), cement (portland), sand and gravel (construction), sand and gravel (industrial), iodine (crude).
Oregon	432,000	35	0.78	Stone (crushed), sand and gravel (construction), cement (portland), diatomite, lime.
Pennsylvania[2]	1,550,000	12	2.81	Stone (crushed), cement (portland), sand and gravel (construction), lime, cement (masonry).
Rhode Island[2]	35,400	49	0.06	Sand and gravel (construction), stone (crushed), sand and gravel (industrial), gemstones (natural).
South Carolina	659,000	28	1.19	Stone (crushed), cement (portland), cement (masonry), sand and gravel (construction), sand and gravel (industrial).
South Dakota	215,000	39	0.39	Cement (portland), sand and gravel (construction), stone (crushed), gold, stone (dimension).
Tennessee	770,000	26	1.39	Stone (crushed), cement (portland), sand and gravel (construction), clays (ball), sand and gravel (industrial).
Texas	2,720,000	6	4.93	Cement (portland), stone (crushed), sand and gravel (construction), salt, sand and gravel (industrial).
Utah	2,790,000	5	5.05	Molybdenum (concentrates), copper, gold, cement (portland), sand and gravel (construction).
Vermont[2]	96,800	46	0.18	Stone (crushed), sand and gravel (construction), stone (dimension), talc (crude), gemstones (natural).
Virginia	1,160,000	18	2.10	Stone (crushed), cement (portland), sand and gravel (construction), lime, zirconium (concentrates).
Washington	633,000	30	1.15	Sand and gravel (construction), stone (crushed), cement (portland), zinc, gold.
West Virginia	200,000	41	0.36	Stone (crushed), cement (portland), sand and gravel (industrial), lime, cement (masonry).
Wisconsin[2]	562,000	34	1.02	Stone (crushed), sand and gravel (construction), lime, sand and gravel (industrial), stone (dimension).
Wyoming	1,300,000	14	2.36	Soda ash, clays (bentonite), helium (Grade-A), sand and gravel (construction), cement (portland).
Undistributed	431,000	XX	0.78	
Total	55,200,000	XX	100.00	

XX Not applicable.

[1]Data are rounded to three significant digits; may not add to totals shown.

[2]Partial total; excludes values that must be withheld to avoid disclosing company proprietary data which are included with "Undistributed."

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TABLE 4

VALUE OF NONFUEL MINERAL PRODUCTION PER CAPITA AND PER SQUARE KILOMETER IN 2005 BY STATE[1]

State	Area (square kilometers)	Population (thousands)	Total value (thousands)	Per capita		Per square kilometer	
				Dollars	Rank	Dollars	Rank
Alabama	134,000	4,560	$1,120,000	$246	14	$8,390	20
Alaska	1,530,000	664	1,470,000	2,220	2	961	48
Arizona	295,000	5,940	4,350,000	732	6	14,700	4
Arkansas	138,000	2,780	591,000	213	16	4,290	30
California	411,000	36,100	4,240,000	117	30	10,300	16
Colorado	270,000	4,670	1,750,000	376	10	6,500	25
Connecticut	13,000	3,510	157,000 [2]	45	46	12,100	8
Delaware	5,290	844	20,000 [2]	24	50	3,780	36
Florida	152,000	17,800	2,890,000	162	21	19,000	2
Georgia	153,000	9,070	1,810,000	199	17	11,800	9
Hawaii	16,800	1,280	100,000	78	40	5,970	26
Idaho	216,000	1,430	906,000	634	7	4,190	31
Illinois	146,000	12,800	1,210,000	95	37	8,300	21
Indiana	93,700	6,270	883,000	141	25	9,420	19
Iowa	146,000	2,970	641,000	216	15	4,400	29
Kansas	213,000	2,750	870,000	317	12	4,080	32
Kentucky	105,000	4,170	765,000	183	18	7,310	23
Louisiana	124,000	4,520	393,000	87	39	3,180	42
Maine	86,200	1,320	141,000	107	32	1,630	46
Maryland	27,100	5,600	577,000 [2]	103	34	21,300	1
Massachusetts	21,500	6,400	250,000 [2]	39	48	11,700	10
Michigan	152,000	10,100	1,750,000	173	19	11,500	11
Minnesota	219,000	5,130	2,190,000 [2]	427	9	10,000	18
Mississippi	124,000	2,920	215,000	73	41	1,740	44
Missouri	181,000	5,800	1,940,000	335	11	10,800	15
Montana	381,000	936	847,000	906	5	2,230	43
Nebraska	200,000	1,760	110,000 [2]	63	45	550	49
Nevada	286,000	2,420	3,880,000	1,610	3	13,600	5
New Hampshire	24,000	1,310	88,200 [2]	67	43	3,670	37
New Jersey	20,200	8,720	344,000 [2]	39	47	17,000	3
New Mexico	315,000	1,930	1,150,000	596	8	3,650	38
New York	127,000	19,300	1,290,000	67	44	10,200	17
North Carolina	136,000	8,680	792,000 [2]	91	38	5,810	27
North Dakota	183,000	637	45,600	72	42	249	50
Ohio	107,000	11,500	1,210,000	105	33	11,300	13
Oklahoma	181,000	3,550	606,000	171	20	3,350	40
Oregon	251,000	3,640	432,000	119	29	1,720	45
Pennsylvania	117,000	12,400	1,550,000 [2]	125	27	13,200	6
Rhode Island	3,140	1,080	35,400 [2]	33	49	11,300	12
South Carolina	80,600	4,260	659,000	155	23	8,180	22
South Dakota	200,000	776	215,000	277	13	1,080	47
Tennessee	109,000	5,960	770,000	129	26	7,060	24
Texas	691,000	22,900	2,720,000	119	28	3,940	33
Utah	220,000	2,470	2,790,000	1,130	4	12,700	7
Vermont	24,900	623	96,800 [2]	155	22	3,890	34
Virginia	106,000	7,570	1,160,000	153	24	10,900	14
Washington	176,000	6,290	633,000	101	36	3,590	39
West Virginia	62,800	1,820	200,000	110	31	3,200	41
Wisconsin	145,000	5,540	562,000 [2]	102	35	3,870	35
Wyoming	253,000	509	1,300,000	2,550	1	5,130	28
Undistributed	XX	XX	431,000	XX	XX	XX	XX
Total or average	9,370,000 [3]	296,000 [3]	55,200,000	186	XX	5,890	XX

XX Not applicable.

[1]Data are rounded to three significant digits; may not add to totals shown.

[2]Partial total; excludes values that must be withheld to avoid disclosing company proprietary data. Withheld values included with "Undistributed."

[3]Excludes Washington, DC (which has no mineral production), with an area of 179 square kilometers and a population of 551,000.

Sources: U.S. Geological Survey and U.S. Census Bureau.

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TABLE 5
NONFUEL MINERAL PRODUCTION IN THE UNITED STATES, BY STATE[1, 2]

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral	2003		2004		2005	
	Quantity	Value	Quantity	Value	Quantity	Value
Alabama:						
Cement:						
Masonry	565	55,700 e	430	49,400 e	475	54,800 e
Portland	4,330	273,000 e	4,800	320,000 e	5,120	421,000 e
Clays:						
Bentonite	125	3,810	100	3,050	109	3,480
Common	1,920	24,000	2,120	29,600	2,280	29,000
Gemstones	NA	356	NA	356	NA	371
Lime	2,290	151,000	2,280	164,000	2,240	181,000
Sand and gravel:						
Construction	14,500	67,600	14,700	65,300	15,700	70,500
Industrial	723	9,180	643	9,800	710	11,200
Stone, crushed	49,300	286,000	47,800 r	296,000 r	49,500	325,000
Combined values of clays (kaolin), iron oxide pigments (crude), mica [crude (2004)], salt, stone (dimension marble and sandstone)	XX	30,000	XX	27,000	XX	27,000
Total	XX	900,000	XX	965,000 r	XX	1,120,000
Alaska:						
Gemstones	NA	12	NA	12	NA	12
Sand and gravel, construction	9,980	55,700	9,430	51,600	8,660	48,100
Stone, crushed	2,640 3	15,300 3	2,270 r	14,200 r	2,360	15,600
Combined values of cadmium [byproduct of zinc concentrates (2004-05)], gold, lead, silver, stone [crushed granite and shell (2003-04)], zinc	XX	1,010,000	XX	1,200,000	XX	1,410,000
Total	XX	1,080,000	XX	1,270,000	XX	1,470,000
Arizona:						
Copper[4]	741	1,390,000	723	2,130,000	690	2,640,000
Gemstones	NA	1,440	NA	1,450	NA	1,370
Sand and gravel:						
Construction	62,600	340,000	79,600	430,000	84,900	516,000
Industrial	(5)	W	(5)	792	(5)	W
Stone, crushed	9,950	49,100	14,100 r	75,900 r	12,000 3	69,300 3
Combined values of cement, clays (bentonite, common), gold, gypsum (crude), lime, molybdenum concentrates, perlite (crude), pumice and pumicite, salt, silver, stone [crushed traprock (2005), dimension sandstone], zeolites (2004-05), and values indicated by symbol W	XX	394,000	XX	709,000	XX	1,120,000
Total	XX	2,180,000	XX	3,350,000 r	XX	4,350,000
Arkansas:						
Clays, common	897	1,410	1,150	1,510	1,210	1,900
Gemstones	NA	477	NA	590	NA	711
Sand and gravel, construction	9,720	52,100	9,370	53,500	10,600	62,000
Silica stone[6] metric tons	513	3,630	655	3,660	576	2,290
Stone, crushed	29,700	145,000	34,100 r, 3	173,000 r, 3	35,400 3	223,000 3
Combined values of bromine, cement, clays (kaolin), gypsum (crude), lime, sand and gravel (industrial), stone [crushed slate (2004-05), dimension limestone and sandstone], tripoli	XX	252,000	XX	299,000 r	XX	302,000
Total	XX	,454,000	XX	,531,000 r	XX	591,000
California:						
Boron minerals	1,150	591,000	1,210	626,000	1,150	713,000
Cement:						
Masonry	(5)	W	(5)	W	694	80,600 e
Portland	11,600	887,000 e	11,900	1,000,000 e	11,600	1,130,000 e
Clays:						
Bentonite	23	2,560	24	2,640	20	2,200
Common	1,240	19,100	1,230	20,700	1,010	16,600
Fuller's earth	(5)	W	197	W	189	W

See footnotes at end of table.

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TABLE 5—Continued
NONFUEL MINERAL PRODUCTION IN THE UNITED STATES, BY STATE[1, 2]

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral		2003		2004		2005	
		Quantity	Value	Quantity	Value	Quantity	Value
California—Continued:							
Gemstones		NA	1,080	NA	1,070	NA	1,130
Gold[4]	kilograms	4,270	50,100	3,260	43,000	(5)	W
Sand and gravel:							
Construction		152,000	1,150,000	166,000	1,280,000	163,000	1,440,000
Industrial		1,790	50,100	1,990	55,700	2,030	60,400
Silver[4]	kilograms	957	151	801	172	269	63
Stone:							
Crushed		55,500	371,000	55,300 r, 3	364,000 r, 3	54,300	455,000
Dimension		40	9,920	42	10,200	41	10,200
Combined values of clays (kaolin), diatomite, feldspar, gypsum (crude), iron ore (usable shipped), lime, magnesium compounds, perlite (crude), pumice and pumicite, pyrophyllite [crude (2003)], salt, soda ash, stone [crushed shell (2004)], talc [crude (2004)], zeolites (2004), and values indicated by symbol W		XX	308,000	XX	349,000	XX	332,000
Total		XX	3,440,000	XX	3,760,000	XX	4,240,000
Colorado:							
Clays:							
Bentonite		(5)	W	5	W	3	W
Common		259	1,580	249	1,510	255	1,610
Gemstones		NA	281	NA	360	NA	358
Lime		26	2,330	26	2,570	29	3,900
Sand and gravel:							
Construction		37,500	213,000	40,900	235,000	44,700	280,000
Industrial		70	W	(5)	3,300	(5)	W
Stone:							
Crushed		10,400	64,000	11,100 r	68,300 r	13,000	89,100
Dimension		5	1,610	16	1,980	18	2,400
Combined values of cement, gold, gypsum (crude), helium (Grade-A), molybdenum concentrates, silver, soda ash (2003-04), and values indicated by symbol W		XX	391,000	XX	699,000	XX	1,380,000
Total		XX	673,000	XX	1,010,000	XX	1,750,000
Connecticut							
Clays, common		52	143	87	(6)	89	(6)
Gemstones		NA	6	NA	6	NA	6
Sand and gravel, construction		8,150	51,200	8,330	55,600	8,400	64,200
Stone:							
Crushed		10,400	81,800	10,100 r	75,700	10,100	92,600
Dimension		(5)	(7)	(5)	(7)	(5)	(7)
Total		XX	133,000	XX	131,000	XX	157,000
Delaware:							
Gemstones		NA	1	NA	1	NA	1
Magnesium compounds	metric tons	(5)	(7)	(5)	(7)	(5)	(7)
Sand and gravel, construction		2,550	17,900	2,980	21,900	2,640	20,000
Stone, crushed		--	--	--	--	(5)	(7)
Total		XX	17,900	XX	21,900	XX	20,000
Florida:							
Cement:							
Masonry		674	82,900 e	763	97,600 e	902	129,000 e
Portland		4,190	323,000 e	5,230	432,000 e	5,730	519,000 e
Clays:							
Common		94 e	1,280 e	(5)	W	(5)	W
Fuller's earth		(5)	W	234	W	279	W
Kaolin		31	3,250	31	3,280	29	3,510
Gemstones		NA	1	NA	1	NA	1
Lime		--	--	24	2,090	23	2,940
Peat		373	7,440	478	9,710	464	9,450

See footnotes at end of table.

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TABLE 5—Continued
NONFUEL MINERAL PRODUCTION IN THE UNITED STATES, BY STATE[1, 2]

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral	2003		2004		2005	
	Quantity	Value	Quantity	Value	Quantity	Value
Florida—Continued:						
Sand and gravel:						
Construction	30,900	141,000	29,300	146,000	37,500	210,000
Industrial	624	7,270	679	8,520	715	9,410
Stone, crushed	97,100	587,000	105,000 [3]	680,000 [r, 3]	115,000 [3]	994,000 [3]
Combined values of magnesium compounds, phosphate rock, staurolite, stone [crushed sandstone (2004-05)], titanium concentrates, zirconium concentrates, and values indicated by symbol W	XX	918,000	XX	945,000	XX	1,010,000
Total	XX	2,070,000	XX	2,320,000	XX	2,890,000
Georyia:						
Clays:						
Common	1,280	4,430	1,550	8,710	1,530	8,730
Fuller's earth	1,570	145,000	1,400	142,000	1,410	147,000
Kaolin	6,610	884,000	6,780	898,000	7,190	825,000
Gemstones	NA	8	NA	9	NA	9
Sand and gravel:						
Construction	7,690	31,800	9,270	39,400	11,100	68,300
Industrial	590	11,900	665	13,400	689	15,000
Stone:						
Crushed	75,200	519,000	79,700 [r]	548,000 [r]	79,400	606,000
Dimension	114	22,700	146	22,100	246	21,000
Combined values of barite, cement, feldspar, iron oxide pigments (crude), lime, mica (crude)	XX	117,000	XX	134,000	XX	115,000
Total	XX	1,740,000	XX	1,810,000 [r]	XX	1,810,000
Hawaii:						
Cement, masonry	(5)	(7)	--	--	--	--
Gemstones	NA	119	NA	262	NA	217
Sand and gravel, construction	808	9,560	1,260	12,100	1,390	17,500
Stone, crushed	5,620	65,400	5,470 [r]	61,300 [r]	6,170	82,300
Total	XX	75,100	XX	73,700 [r]	XX	100,000
Idaho:						
Gemstones	NA	477	NA	836	NA	469
Sand and gravel, construction	16,500	59,300	19,600	74,300	20,800	93,800
Stone, crushed	3,160	15,700	3,420 [r]	18,100 [r]	4,450	23,900
Combined values of cadmium [byproduct of zinc concentrates (2004-05)], cement (portland), copper, feldspar, garnet (industrial), gold (2003, 2005), lead, lime, molybdenum concentrates, perlite (crude), phosphate rock, pumice and pumicite, sand and gravel (industrial), silver, stone (dimension quartzite and sandstone), zeolites (2004-05), zinc	XX	193,000	XX	354,000	XX	788,000
Total	XX	269,000	XX	447,000 [r]	XX	906,000
Illinois:						
Cement, portland	2,930	210,000 [e]	3,010	233,000 [e]	3,240	286,000 [e]
Clays:						
Common	179	1,010	247	1,390	119	667
Fuller's earth	(5)	W	218	W	225	W
Gemstones	NA	28	NA	70	NA	14
Sand and gravel:						
Construction	34,600	161,000	38,700	203,000	37,400	210,000
Industrial	4,440	72,600	4,950	86,200	5,510	104,000
Stone, crushed	76,000 [3]	453,000 [3]	75,300 [r]	462,000 [r]	76,200	545,000
Combined values of lime, peat, stone [crushed sandstone (2003), dimension dolomite (2005)], tripoli, and values indicated by symbol W	XX	74,000	XX	65,000 [r]	XX	64,500
Total	XX	971,000	XX	1,050,000	XX	1,210,000

See footnotes at end of table.

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TABLE 5—Continued
NONFUEL MINERAL PRODUCTION IN THE UNITED STATES, BY STATE[1, 2]

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral	2003		2004		2005	
	Quantity	Value	Quantity	Value	Quantity	Value
Indiana:						
Cement, portland	2,930	203,000 e	3,080	218,000 e	3,060	243,000 e
Clays, common	385	767	729	1,890	809	13,500
Gemstones	NA	4	NA	4	NA	4
Sand and gravel, construction	32,900	129,000	28,300	116,000	28,400	135,000
Stone:						
Crushed	50,500	237,000	56,800	265,000 r	57,500	311,000
Dimension	242	42,100	251	45,500	240	46,300
Combined values of cement (masonry), clays (ball), gypsum (crude), lime, peat, sand and gravel (industrial)	XX	104,000	XX	129,000 r	XX	135,000
Total	XX	716,000	XX	776,000 r	XX	883,000
Iowa:						
Clays, common	256	763	325	1,150	630	4,740
Gemstones	NA	2	NA	2	NA	2
Sand and gravel, construction	13,400	61,000	17,100	74,300	19,900	93,100
Stone, crushed	35,600	207,000	35,800 r	219,000 r	34,500	251,000
Combined values of cement, gypsum (crude), lime, peat, sand and gravel (industrial)	XX	235,000	XX	239,000	XX	292,000
Total	XX	504 000	XX	534,000 r	XX	641,000
Kansas:						
Cement, portland	2,270	173,000 e	2,690	212,000 e	2,890	244,000 e
Clays, common	632	10,000	621	7,460	654	4,590
Gemstones	NA	1	NA	1	NA	1
Helium, Grade-A million cubic meters	77	179,000	82	189,000	90	226,000
Salt	2,770	123,000	2,890	127,000	2,890	135,000
Sand and gravel, construction	10,700	34,900	9,930	32,800	10,100	36,900
Stone:						
Crushed	20,700	111,000	20,600 r	122,000 r	22,100	159,000
Dimension	15	1,640	14	1,730	13	1,590
Combined values of cement (masonry), clays (fuller's earth), gypsum (crude), helium (crude), pumice and pumicite, sand and gravel (industrial)	XX	65,100	XX	75,300	XX	63,100
Total	XX	696,000	XX	768,000 r	XX	870,000
Kentucky:						
Clays, common	983	3,770	978	4,510	1,060	4,370
Gemstones	NA	22	NA	22	NA	78
Sand and gravel, construction	10,000	46,500	10,300	49,700	10,500	55,000
Stone, crushed	52,400	326,000	62,100 r, 3	384,000 r, 3	58,200 3	421,000 3
Combined values of cement, clays (ball), lime, stone [crushed dolomite (2004-05)]	XX	220,000	XX	253,000 r	XX	285,000
Total	XX	597 000	XX	691,000 r	XX	765,000
Louisiana:						
Clays, common	670	1,690	399	1,030 r	416	13,100
Gemstones	NA	6	NA	6	NA	6
Salt	12,600	152,000	14,300	186,000	13,800	182,000
Sand and gravel:						
Construction	21,200	105,000	19,400	103,000	18,600	113,000
Industrial	499	17,200	476	14,800	509	11,600
Combined values of gypsum (crude), lime, stone [crushed limestone and sandstone (2004-05), limestone, sandstone, miscellaneous (2003)]	XX	91,000	XX	51,300 r	XX	73,800
Total	XX	367,000	XX	356,000	XX	393,000
Maine:						
Clays, common	49 e	125 e	49	W	50	W
Gemstones	NA	262	NA	268	NA	272
Sand and gravel, construction	10,400	47,600	10,800	49,100	11,100	57,400
Stone, crushed	3,530	22,500	4,370	29,500	4,490	30,700

See footnotes at end of table.

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TABLE 5—Continued
NONFUEL MINERAL PRODUCTION IN THE UNITED STATES, BY STATE[1, 2]

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral	2003		2004		2005	
	Quantity	Value	Quantity	Value	Quantity	Value
Maine—Continued:						
Combined values of cement [masonry (2003-04), portland], peat, stone (dimension granite), and values indicated by symbol W	XX	36,700	XX	39,300	XX	52,400
Total	XX	107,000	XX	118,000	XX	141,000
Maryland:						
Cement, portland	2,200	147,000 e	2,520	175,000 e	3,550	210,000 e
Clays, common	269	550	262	571	317	686
Gemstones	NA	1	NA	1	NA	1
Sand and gravel, construction	11,800	79,900	12,700	75,500	12,300	89,500
Stone:						
Crushed	26,200 [3]	165,000 [3]	35,300 r	214,000 r	33,100	274,000
Dimension	24	2,700	27	9,580	26	3,010
Combined values of cement (masonry), sand and gravel (industrial), stone [crushed marble, shell, traprock (2003-04)]	XX	31,700	XX	(7)	XX	(7)
Total	XX	427,000	XX	474,000 r	XX	577,000
Massachusetts:						
Clays, common	36	321	36	(7)	37	(7)
Gemstones	NA	1	NA	1	NA	1
Lime	(5)	(7)	(5)	(7)	(5)	(7)
Sand and gravel, construction	12,900	80,800	14,400	90,000	16,500	117,000
Stone:						
Crushed	13,000	111,000	13,700 r	109,000	13,200	121,000
Dimension	81	11,300	82	11,600	82	11,500
Total	XX	204,000	XX	211,000 r	XX	250,000
Michigan:						
Cement, masonry	237	24,300 e	231	27,100 e	228	27,500 e
Clays, common	588	3,050	605	3,070	334	514
Gemstones	NA	1	NA	1	NA	1
Gypsum, crude	500	6,130	452	5,660	1,050	10,700
Peat	125	3,460	122	3,360	117	3,300
Sand and gravel:						
Construction	71,000	253,000	69,500	254,000	64,800	243,000
Industrial	2,130	31,400	1,690	25,200	1,610	24,500
Stone, crushed	33,600 [3]	123,000 [3]	36,700 r, 3	143,000 r, 3	36,100	141,000
Combined values of bromine, cement (portland), iron ore (usable shipped), iron oxide pigments (crude), lime, magnesium compounds, potash, salt, stone [crushed marl and miscellaneous (2003), crushed marl (2004), dimension dolomite and sandstone]	XX	1,140,000	XX	1,210,000	XX	1,300,000
Total	XX	1,580,000	XX	1,680,000 r	XX	1,750,000
Minnesota:						
Clays, common	20	22	20	22	20	22
Gemstones	NA	6	NA	6	NA	6
Iron ore, usable shipped	34,000	1,030,000	41,400	1,560,000	40,600	1,830,000
Lime	(5)	(7)	(5)	(7)	(5)	(7)
Peat	60	5,070	63	5,210	68	5,670
Sand and gravel:						
Construction	48,900	212,000	54,900	235,000	54,100	253,000
Industrial	(5)	(7)	(5)	(7)	(5)	(7)
Stone:						
Crushed	9,880	61,800	10,400 r, 3	64,900 r, 3	10,500	86,900
Dimension	16	11,900	22	12,400	19	13,400
Total	XX	1,320,000	XX	1,880,000 r	XX	2,190,000

See footnotes at end of table.

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TABLE 5—Continued
NONFUEL MINERAL PRODUCTION IN THE UNITED STATES, BY STATE[1, 2]

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral		2003 Quantity	2003 Value	2004 Quantity	2004 Value	2005 Quantity	2005 Value
Mississippi:							
Clays:							
Common		524	2,050	610	2,700	642	2,860
Fuller's earth		534	42,700	381	35,200	354	33,000
Gemstones		NA	1	NA	1	NA	1
Sand and gravel, construction		14,600	82,600	14,100	80,700	14,400	85,200
Stone, crushed		2,850	33,900	2,760	34,200	3,500	41,700
Combined values of cement (portland), clays (ball, bentonite), sand and gravel (industrial)		XX	31,400	XX	41,500	XX	52,000
Total		XX	193 000	XX	194,000	XX	215,000
Missouri:							
Cement, portland		5,180	352,000 e	5,260	388,000 e	5,330	464,000 e
Clays:							
Common		970	3,660	911	3,290	822	3,400
Fire		307	7,230	(5)	W	(5)	W
Sand and gravel:							
Construction		10,600	49,400	12,200	60,000	12,200	61,600
Industrial		586	12,800	589	14,200	559	14,500
Stone, crushed		71,500	426,000	92,600 r	564,000 r	99,400	733,000
Combined values of cadmium [byproduct of zinc concentratres (2004-05)], cement (masonry), clays (fuller's earth), copper, gemstones (natural), lead, lime, silver, stone (dimension granite), zinc, and values indicated by symbol W		XX	488,000	XX	593,000	XX	666,000
Total		XX	1,340,000	XX	1,620,000 r	XX	1 940,000
Montana:							
Clays, bentonite		181	14,900	102	8,400	128	5,440
Gemstones		NA	707	NA	653	NA	644
Palladium[4]	kilograms	14,000	91,400	13,700	102,000	13,300	87,100
Platinum[4]	do.	4,170	93,100	4,040	110,000	3,920	113,000
Sand and gravel, construction		15,200	74,200	14,400	80,000	14,000	83,600
Stone:							
Crushed		3,060	12,200	4,090	13,700 r	3,540	16,800
Dimension		14	2,590	14	2,550	12	2,620
Combined values of cadmium [byproduct in zinc concentrates (2004-05)], cement [masonry (2003, 2005), portland], clays (common), copper, garnet [industrial (2005)], gold, lead, lime, molybdenum concentrates, peat, silver, talc (crude), zinc		XX	205,000	XX	303,000	XX	538,000
Total		XX	494,000	XX	621,000 r	XX	847,000
Nebraska:							
Cement:							
Masonry		(5)	(7)	(5)	(7)	(5)	(7)
Portland		(5)	(7)	(5)	(7)	(5)	(7)
Clays, common		133 e	338 e	133 e	338 e	160 e	(7)
Gemstones		NA	4	NA	4	NA	4
Lime		8	692	11	514	12	625
Sand and gravel:							
Construction		13,300	45,000	15,100	53,200	14,300	60,200
Industrial		(5)	(7)	(5)	(7)	--	--
Stone, crushed		6,960	49,200	6 900	51 900	6,950	49,300
Total		XX	95,300	XX	106,000	XX	110,000
Nevada:							
Clays:							
Bentonite		6	817	7	W	7	W
Fuller's earth		28	3,870	(5)	W	(5)	W
Gold[4]	kilograms	227,000	2,660,000	216,000	2,850,000	212,000	3,030,000
Sand and gravel, construction		37,100	174,000	43,100	197,000	52,300	230,000

See footnotes at end of table.

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TABLE 5—Continued
NONFUEL MINERAL PRODUCTION IN THE UNITED STATES, BY STATE[1, 2]

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral		2003		2004		2005	
		Quantity	Value	Quantity	Value	Quantity	Value
Nevada—Continued:							
Silver[4]	kilograms	322,000	50,900	302,000	65,000	276,000	65,200
Stone, crushed		7,830	48,500	9,760	72,800	9,320	66,800
Combined values of barite, brucite (2003-04), cement (portland), clays (kaolin), copper (2004-05), diatomite, gemstones, gypsum (crude), lime, lithium carbonate, magnesite, perlite (crude), salt, sand and gravel (industrial), zeolites (2004-05), and values indicated by symbol W		XX	252,000	XX	286,000	XX	488,000
Total		XX	3,190,000	XX	3,470,000	XX	3,880,000
New Hampshire:							
Gemstones		NA	6	NA	6	NA	6
Sand and gravel, construction		8,470	41,200	8,940	46,600	8,400	47,400
Stone:							
Crushed		4,110	21,400	4,720 r	23,900 r	5,100	40,900
Dimension, granite		(5)	(7)	(5)	(7)	(5)	(7)
Total		XX	, 62 500	XX	70 500 r	XX	, 88 200
New Jersey:							
Clays, common		(5)	W	(5)	122	(5)	W
Gemstones		NA	1	NA	1	NA	1
Sand and gravel:							
Construction		18,200	105,000	20,100	120,000	21,200	145,000
Industrial		1,570	32,700	2,020	35,800	1,820	34,100
Stone, crushed		24,800	179,000	25,400 r, 3	185,000 r, 3	22,700	160,000
Combined values of greensand marl, peat, stone [crushed miscellaneous (2004)], and values indicated by symbol W		XX	4,190	XX	4,400 r	XX	4,110
Total		XX	321,000	XX	345,000 r	XX	344,000
New Mexico:							
Clays, common		36	209	34	177	36	221
Copper[4]		88	165,000	122	362,000	131	502,000
Gemstones		NA	20	NA	20	NA	19
Sand and gravel:							
Construction		13,300	65,300	13,600	89,500	16,000	112,000
Industrial		--	--	--	--	113	W
Silver[4]	kilograms	--	--	3,570	767	6,390	1,510
Stone:							
Crushed		3,730	26,000	2,830 r, 3	16,400 r, 3	3,010	20,100
Dimension		57	2,590	57	2,430	7	279
Combined values of cement, gold (2004-05), gypsum (crude), helium [Grade-A (2003-04)], lime, mica [crude (2003-04)], molybdenum concentrates, perlite (crude), potash, pumice and pumicite, salt, stone [crushed granite (2004)], zeolites (2004-05), and values indicated by symbol W		XX	310,000	XX	397,000 r	XX	513,000
Total		XX	,569,000	XX	868,000 r	XX	1,150,000
New York:							
Clays, common		644	8,050	756	10,900	785	11,700
Gemstones		NA	65	NA	74	NA	78
Gypsum, crude		--	--	--	--	2,230	11,400
Salt		5,230	225,000	6,430	301,000	6,840	327,000
Sand and gravel, construction		30,200	172,000	33,100	189,000	31,300	204,000
Stone:							
Crushed		53,700	352,000	49,400 r	327,000 r	52,700	445,000
Dimension		65	6,110	44	4,560	42	7,470
Combined values of cement, garnet (industrial), peat, sand and gravel [industrial (2003-04)], talc (crude), wollastonite		XX	235,000	XX	256,000	XX	286,000
Total		XX	998,000	XX	1,090,000 r	XX	1,290,000

See footnotes at end of table.

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TABLE 5—Continued
NONFUEL MINERAL PRODUCTION IN THE UNITED STATES, BY STATE[1, 2]

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral		2003 Quantity	2003 Value	2004 Quantity	2004 Value	2005 Quantity	2005 Value
North Carolina:							
Clays:							
Common		2,190	10,900	2,260	12,900	2,180	13,900
Kaolin		(5)	4,500	34	764	27	593
Feldspar		362	18,900	351	20,500	351	19,000
Gemstones		NA	279	NA	280	NA	280
Mica, crude		39	9,580	40	9,600	39	10,200
Sand and gravel:							
Construction		10,500	55,600	11,500	59,700	12,000	63,900
Industrial		1,530	26,700	1,630	29,000	1,150	29,200
Stone:							
Crushed		67,100	505,000	72,300	549,000 r	74,300	638,000
Dimension		47	18,700	43	18,200	39	17,000
Combined values of olivine (2003-04), phosphate rock, pyrophyllite (crude)		XX	84,500	XX	105,000	XX	(7)
Total		XX	734,000	XX	805,000 r	XX	792,000
North Dakota:							
Clays, common		(5)	W	(5)	186	76	W
Gemstones		NA	4	NA	4	NA	4
Sand and gravel, construction		13,500	35,900	11,700	32,800	11,300	34,500
Stone, crushed		(5)	W	(5)	W	89	396
Combined values of lime, sand and gravel (industrial), stone [crushed limestone, volcanic cinder, and miscellaneous (2003), crushed granite, traprock, volcanic cinder, miscellaneous (2004)], and values indicated by symbol W		XX	10,600	XX	11,300 r	XX	10,800
Total		XX	46,500	XX	44,300 r	XX	45,600
Ohio:							
Cement:							
Masonry		(5)	W	1,020	85,700 e	(5)	W
Portland		1,030	82,200 e	98	13,000 e	986	89,200 e
Clays:							
Common		1,440	7,430	1,360	7,480	1,310	6,880
Fire		(5)	W	42	W	55	W
Gemstones		NA	4	NA	4	NA	4
Lime		1,880	114,000	1,880	127,000	1,790	130,000
Sand and gravel:							
Construction		47,300	242,000	50,800	263,000	51,700	288,000
Industrial		1,120	32,100	1,180	34,200	1,230	37,900
Stone:							
Crushed		70,500	339,000	76,500 r	396,000 r	75,200	437,000
Dimension		30	5,090	38	5,100	28	4,880
Combined values of peat, salt, and values indicated by symbol W		XX	188,000	XX	197,000	XX	211,000
Total		XX	1,010,000	XX	1,130,000 r	XX	1,210,000
Oklahoma:							
Clays, common		1,160	2,390	1,150	2,410	903	2,520
Gemstones		NA	197	NA	4	NA	43
Gypsum, crude		2,250	14,100	3,250	20,800	2,620	18,400
Iodine, crude	metric tons	1,090	W	1,130	W	1,570	W
Sand and gravel:							
Construction		11,000	48,500	12,000	53,700	13,300	65,000
Industrial		1,360	29,700	1,390	31,600	1,480	33,500
Stone:							
Crushed		40,100	193,000	39,800 r	206,000 r	45,400	257,000
Dimension		17	2,100	17	2,100	3	501
Tripoli	metric tons	10,600	1,960	32,100	2,120	30,600	1,950

See footnotes at end of table.

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TABLE 5—Continued
NONFUEL MINERAL PRODUCTION IN THE UNITED STATES, BY STATE[1, 2]

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral		2003 Quantity	2003 Value	2004 Quantity	2004 Value	2005 Quantity	2005 Value
Oklahoma—Continued:							
Combined values of cement, feldspar, helium (Grade-A), lime, salt, and values indicated by symbol W		XX	179,000	XX	199,000	XX	227,000
Total		XX	470,000	XX	519,000 r	XX	606,000
Oregon:							
Clays, bentonite		(5)	W	10	W	9	W
Gemstones		NA	1,200	NA	1,210	NA	1,180
Sand and gravel, construction		18,500	110,000	21,000	125,000	22,000	146,000
Stone, crushed		21,800	117,000	22,700 r	126,000	26,000	157,000
Zeolites	metric tons	(5)	NA	--	--	--	--
Combine values of cement (portland), clays (common), diatomite, lime, perlite (crude), pumice and pumicite, talc (crude), and values indicated by symbol W		XX	92,700	XX	114,000	XX	128,000
Total		XX	320,000	XX	367,000	XX	432,000
Pennsylvania:							
Cement:							
Masonry		342	35,900 e	(5)	W	399	49,700 e
Portland		5,720	421,000 e	6,230	473,000 e	6,290	554,000 e
Clays, common		750	2,240	822	3,270	705	3,460
Gemstones		NA	1	NA	1	NA	1
Lime		1,190	90,100	1,220	100,000	1,100	104,000
Peat		8	219	11	307	7	210
Sand and gravel:							
Construction		18,400	115,000	20,000	127,000	17,000	111,000
Industrial		(5)	W	(5)	W	711	15,400
Stone:							
Crushed		104,000	597,000	113,000 r	639,000 r	106,000	704,000
Dimension		32	10,400	33	10,100	35	11,800
Combined values of tripoli and values indicated by symbol W		XX	(7)	XX	55,800	XX	(7)
Total		XX	1,270,000	XX	1,410,000 r	XX	1,550,000
Rhode Island:							
Gemstones		NA	1	NA	1	NA	1
Sand and gravel:							
Construction		2,450	21,000	2,490	22,000	2,510	23,000
Industrial		(5)	(7)	(5)	(7)	(5)	(7)
Stone, crushed		1,340	10,700	1,600 3	12,400 3	1,610 4	12,400 4
Total		XX	31,700	XX	34,400	XX	35,400
South Carolina:							
Cement:							
Masonry		425	43,700 e	453	49,900 e	498	54,300 e
Portland		3,150	194,000 e	3,110	196,000 e	3,270	247,000 e
Clays:							
Common		1,060	2,660	1,050	3,350	1,020	3,610
Fire		(5)	W	1	64	54	892
Kaolin		355	21,700	296	19,600	287	17,700
Gemstones		NA	1	NA	1	NA	1
Sand and gravel:							
Construction		10,100	34,700	9,960	35,100	11,100	45,200
Industrial		655	16,700	719	17,600	794	19,400
Stone:							
Crushed		27,300	184,000	31,300	210,000	33,800 3	258,000 3
Dimension		9	850	9	850	9	850
Combined values of mica (crude), stone [crushed marble (2005)], vermiculite (crude), and value indicated by symbol W		XX	10,100	XX	(7)	XX	12,600
Total		XX	508,000	XX	532,000	XX	659,000

See footnotes at end of table.

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TABLE 5—Continued
NONFUEL MINERAL PRODUCTION IN THE UNITED STATES, BY STATE[1, 2]

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral		2003 Quantity	2003 Value	2004 Quantity	2004 Value	2005 Quantity	2005 Value
South Dakota:							
Clays, common		213	W	188	W	183	W
Sand and gravel, construction		11,800	44,800	14,000	51,700	12,800	45,500
Stone, crushed		6,880	24,700	6,410 r	27,600 r	6,650	30,600
Combined values of cement (portland), feldspar, gemstones, gold, gypsum (crude), lime, mica crude), stone (dimension granite), and values indicated by symbol W		XX	130,000	XX	131,000	XX	139,000
Total		XX	199,000	XX	210,000 r	XX	215,000
Tennessee:							
Clays:							
Ball		766	33,400	762	34,300	740	32,500
Common		304	585	365	3,140	372	3,210
Fuller's earth		92 e	5,000 e	(5)	W	(5)	W
Sand and gravel:							
Construction		7,550	44,100	7,830	47,500	7,570	51,500
Industrial		961	21,800	975	26,100	985	26,500
Stone, crushed		55,100	354,000	57,900	381,000 r	63,900	482,000
Combined values of cadmium [byproduct in zinc concentrates (2004)], cement, clays (kaolin), gemstones, lime, salt, stone (dimension marble), zinc (2003-04), and values indicated by symbol W		XX	164,000	XX	160,000 r	XX	174,000
Total		XX	623,000	XX	652,000 r	XX	770,000
Texas:							
Cement:							
Masonry		307	36,100 e	319	38,000 e	395	48,500 e
Portland		11,100	747,000 e	11,200	800,000 e	11,600	951,000 e
Clays:							
Common		2,110	8,890	2,160	8,890	2,340	8,680
Fuller's earth		27	2,400	(5)	W	(5)	W
Kaolin		33	7,150	(5)	W	(5)	W
Gemstones		NA	201	NA	201	NA	201
Gypsum, crude		1,810	12,300	2,450	18,800	1,540	11,800
Lime		1,630	110,000	1,630	115,000	1,610	112,000
Salt		9,640	116,000	9,870	118,000	9,600	118,000
Sand and gravel:							
Construction		86,200	425,000	81,700	436,000	80,700	472,000
Industrial		1,930	81,700	2,790	109,000	2,840	114,000
Stone:							
Crushed		126,000	595,000	122,000	621,000 r	134,000	823,000
Dimension		87	16,400	64	15,200	44	12,200
Talc, crude		246	W	258	W	(5)	W
Combined values of brucite, clays (ball, bentonite), helium, zeolites (2004-05), and values indicated by symbol W		XX	33,300	XX	46,300	XX	49,300
Total		XX	2,190,000	XX	2 330,000 r	XX	2,720,000
Utah:							
Beryllium concentrates	metric tons	2,100	NA	2,210	NA	2,780	NA
Clays:							
Bentonite		(5)	W	73	W	64	W
Common		300	3,270	443	5,600	478	6,710
Gemstones		NA	233	NA	235	NA	235
Salt		2,200	119,000	2,250	107,000	2,250	132,000
Sand and gravel, construction		27,400	113,000	29,800	125,000	33,900	149,000
Stone, crushed		7,820	40,100	8,030 r	45,100 r	8,350	46,600

See footnotes at end of table.

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TABLE 5—Continued
NONFUEL MINERAL PRODUCTION IN THE UNITED STATES, BY STATE[1, 2]

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral		2003 Quantity	2003 Value	2004 Quantity	2004 Value	2005 Quantity	2005 Value
Utah—Continued:							
Combined values of cement (portland), copper, gold, gypsum (crude), helium (Grade-A), lime, magnesium compounds, magnesium metal, molybdenum concentrates, perlite (crude), phosphate rock, potash, silver, stone (dimension sandstone), and values indicated by symbol W		XX	1,080,000	XX	1,660,000	XX	2,460,000
Total		XX	1,360,000	XX	1,950,000 r	XX	2,790,000
Vermont:							
Gemstones		NA	1	NA	1	NA	1
Sand and gravel, construction		4,520	21,100	4,970	24,000	5,240	32,000
Stone:							
Crushed		4,290	23,900	5,110	30,800	5,480 [3]	37,000 [3]
Dimension		102	26,700	100	30,600	98	27,800
Talc, crude	metric tons	(5)	(7)	(5)	(7)	(5)	(7)
Total		XX	71,800	XX	85,400	XX	96,800
Virginia:							
Cla s: y							
Bentonite		--	--	5	W	--	--
Common		958	2,530	994	4,640	983	4,690
Kyanite[e]		90	13,400	90	13,400	90	13,400
Sand and gravel, construction		11,300	65,500	12,800	75,800	12,000	85,800
Stone:							
Crushed		66,500	481,000	73,700 r, 3	540,000 r, 3	86,200	778,000
Dimension		6	651	5	594	6	631
Talc, crude		--	--	--	--	1	15
Combined values of cement, clays (fuller's earth), feldspar, gemstones, iron oxide pigments (crude), lime, sand and gravel (industrial), stone [crushed marble (2004)], titanium concentrates (ilmenite), vermiculite (crude), zirconium concentrates, and value indicated by symbol W		XX	223,000	XX	256,000 r	XX	272,000
Total		XX	,786,000	XX	891,000 r	XX	1,160,000
Washington:							
Clays, common		83	204	(5)	W	(5)	W
Gemstones		NA	44	NA	44	NA	44
Sand and gravel, construction		40,700	216,000	41,500	227,000	47,200	282,000
Stone, crushed		12,000	73,700	12,100 r	75,500 r	13,900	96,300
Combined values of cadmium byproduct in zinc concentrates (2004-05), cement (portland), diatomite, gold (2004-05), lead (2004-05), lime, olivine, peat, sand and gravel (industrial), silver (2004-05), stone [dimension miscellaneous (2004-05)], zinc (2004-05), and values indicated by symbol W		XX	107,000	XX	205,000	XX	255,000
Total		XX	396,000	XX	507,000	XX	633,000
West Virginia:							
Cla ys, common		142	376	161	441	186	524
Gemstones		NA	1	NA	1	NA	1
Sand and gravel:							
Construction		971	4,750	524	2,500	318	1,630
Industrial		(5)	W	343	17,300	369	17,800
Stone, crushed		14,100	69,100	14,700	72,600 r	14,500	99,400
Combined values of cement, lime, peat, salt, stone (dimension sandstone), and value indicated by symbol W		XX	90,100	XX	73,500	XX	81,100
Total		XX	164,000	XX	166,000 r	XX	200,000

See footnotes at end of table.

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TABLE 5—Continued
NONFUEL MINERAL PRODUCTION IN THE UNITED STATES, BY STATE[1, 2]

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral	2003		2004		2005	
	Quantity	Value	Quantity	Value	Quantity	Value
Wisconsin:						
Cement, portland	(5)	(7)	(5)	(7)	(5)	(7)
Gemstones	NA	6	NA	6	NA	6
Lime	757	46,000	850	53,900	888	61,300
Peat	(5)	(7)	(5)	(7)	(5)	(7)
Sand and gravel:						
Construction	38,500	150,000	43,400	178,000	43,200	191,000
Industrial	1,930	40,200	2,140	47,000	2,250	55,700
Stone:						
Crushed	35,900	160,000	39,300 r	172,000 r	38,900	227,000
Dimension	101	19,700	232	23,800	278	27,600
Total	XX	417 000	XX	475,000 r	XX	562 000
Wyoming:						
Clays:						
Bentonite	3,420	148,000	3,510	151,000	4,160	190,000
Common	25	55	49	107	53	128
Gemstones	NA	13	NA	13	NA	14
Sand and gravel, construction	8,290	36,400	10,200	40,100	11,700	52,400
Stone, crushed	5,020	22,600	6,300 r	35,300 r	7,370	41,800
Combined values of cement (portland), gypsum (crude), helium (Grade-A), lime, soda ash, zeolites (2004-05)	XX	792,000	XX	819,000	XX	1,010,000
Total	XX	999,000	XX	1 050,000 r	XX	1,300,000
Undistributed:						
Connecticut, Delaware, Hawaii (2003), Maryland (2005), Massachusetts, Minnesota, Nebraska, New Hampshire, North Carolina (2005), Pennsylvania (2003, 2005), Rhode Island, South Carolina (2004), Vermont, Wisconsin, undistributed	XX	220,000	XX	193,000 r	XX	431,000

eEstimated. rRevised. NA Not available. W Withheld to avoid disclosing company proprietary data; included in "Combined values" data for each State. XX Not applicable. -- Zero.

[1]Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

[2]Data are rounded to no more than three significant digits; may not add to totals shown.

[3]Excludes certain stones; kind and value included in "Combined value."

[4]Recoverable content of ores, etc.

[5]Withheld to avoid disclosing company proprietary data.

[6]Grindstones, pulpstones, and sharpening stones; excludes mill liners and grinding pebbles.

[7]Withheld to avoid disclosing company proprietary data; values included in "Undistributed."

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TABLE 6
NONFUEL RAW MINERAL PRODUCTION IN THE COMMONWEALTH OF PUERTO RICO AND ISLANDS ADMINISTERED BY THE UNITED STATES[1, 2]

(Thousand metric tons and thousand dollars)

Mineral	2003		2004		2005	
	Quantity	Value	Quantity	Value	Quantity	Value
Puerto Rico:						
Cement, portland	1,490	W	1,580	W	1,580	W
Clays, common	114	585	114	585	116	596
Lime	(3)	W	11	2,250	11	2,250
Salt	45	1,500	45	1,500	45	1,500
Stone, crushed	9,130	60,000	8,660	57,600	7,830	51,900
Combined values of sand and gravel (industrial), stone (dimension marble), and values indicated by symbol W	XX	119,000	XX	125,000	XX	153,000
Total	XX	181,000	XX	187,000	XX	209,000
Administered Islands:						
American Samoa, stone, crushed, traprock	(3)	(3)	(3)	(3)	(3)	(3)
Guam, stone, crushed	728	7,670	1,410	13,000	1,410	13,000
Virgin Islands, stone, crushed, limestone and traprock	(3)	(3)	(3)	(3)	257	2,730
Total	XX	7,670	XX	13,000	XX	15,800

W Withheld to avoid disclosing company proprietary data; withheld values included in "Combined values" data. XX Not applicable.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

[3]Withheld to avoid disclosing company proprietary data.

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TABLE 7

U.S. EXPORTS OF PRINCIPAL MINERALS AND PRODUCTS, EXCLUDING MINERAL FUELS[1]

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral or product		2004		2005	
		Quantity	Value	Quantity	Value
Metals:					
Aluminum:					
Crude and semicrude	metric tons	1,820,000	4,130,000	2,370,000	5,410,000
Manufactures	do.	129,000	437,000	135,000	482,000
Antimony:					
Metal, alloys, waste and scrap	do.	566	2,280	740	3,250
Oxide, antimon content	do.	3,240	13,200	1,400	5,860
Arsenic metal, arsenic content	do.	220	20,700	327	30,700
Bauxite and alumina:					
Alumina, calcined equivalent		1,230	439,000	1,210	631,000
Bauxite:					
Calcined, refractory and other grade		21	2,950	18	2,330
Crude and dried		42	7,910	34	7,020
Speciality aluminum compounds, sulfate, chloride, fluoride-based	metric tons	26,500 r	20,600 r	26,900	21,600
Beryllium, unwrought, and waste and scrap, other including articles not elsewhere specified	kilograms	217,000	19,600	201,000	16,300
Bismuth, metal, alloys, waste and scrap, bismuth content	do.	109,000	2,500	142,000	4,760
Cadmium:					
Metal, includes cadmium in alloys and scrap	do.	132,000	861	668,000	1,330
Sulfide, gross weight	do.	160,000	76	120,000	55
Chromium:					
Ores and concentrate	metric tons	43,100	10,400	42,600	9,940
Metals and alloys:					
Metal, unwrought powders, waste and scrap, other	do.	931	17,600	1,020	16,900
Ferroalloys, high-carbon, low-carbon, ferrochromium-silicon	do.	9,140	12,000	36,300	38,900
Chemicals:					
Oxides, trioxides and other	do.	12,900	22,200	10,700	18,300
Sulfates	do.	39	417	79	376
Salts of oxometallic or peroxometallic acids, zinc and lead chromate, sodium dichromate, potassium dichromate, other	do.	21,800	14,400	37,900	27,200
Pigments and preparations	do.	671	3,780	767	4,090
Cobalt:					
Acetates and chlorides	do.	666	5,490	703	3,820
Oxides and h droxides	do.	324	13,800	829	17,100
Metal:					
Unwrought, powders, waste and scrap, mattes, other intermediate products of metallurgy	do.	2,110	79,400	1,670	60,600
Wrought and cobalt articles	do.	1,150	48,400	2,340	91,800
Columbium (niobium) and tantalum:					
Columbium:					
Ores and concentrates	do.	16	108	43	398
Ferrocolumbium	do.	294	2,920	410	4,210
Tantalum:					
Ores and concentrates, includes s nthetic	do.	723	19,300	545	9,300
Unwrought, waste and scrap, powders, alloys, metal	do.	598	173,000	699	136,000
Wrought	do.	162	83,400	110	49,000
Copper:					
Unmanufactured, does not include unalloyed scrap, copper content	do.	211,000	429,000	260,000	467,000
Semimanufactures	do.	236,000	863,000	254,000	1,100,000
Scrap, alloyed and unalloyed	do.	714,000	882,000	658,000	1,060,000
Ferroalloys not listed elsewhere:					
Ferrophosphorous	do.	388	335	NA	NA
Other	do.	1,620	2,670	NA	NA
Gold:					
Ores and concentrates	kilograms	1,150	10,200	1,380	13,400
Dore and precipitates	do.	142,000	1,860,000	141,000	2,020,000
Bullion, refined	do.	114,000	1,500,000	182,000	2,550,000
Waste and scrap	do.	725,000 r	815,000	563,000	670,000

See footnotes at end of table.

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TABLE 7—Continued
U.S. EXPORTS OF PRINCIPAL MINERALS AND PRODUCTS, EXCLUDING MINERAL FUELS[1]

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral or product		2004		2005	
		Quantity	Value	Quantity	Value
Metals—Continued:					
Gold—Continued:					
Metal powder	kilograms	647	8,670	687	9,280
Compounds	do.	1,170,000	29,000	1,310,000	30,900
Indium[e]	metric tons	NA	NA	NA	NA
Iron and steel:					
Steel mill products		7,200	9,280,000	8,460	NA
Fabricated steel products		1,470 r	4,340,000	1,710	NA
Cast iron and steel products		234	661,000	193	NA
Iron and steel scrap:					
Ferrous, includes tinplate and ternplate, excludes used rails for rerolling and other uses and ships, boats, and other vessels for scrapping		11,800	2,910,000	13,000	3,430,000
Pig iron, all grades		48	6,690	51	8,110
Direct-reduced iron, steelmaking grade		13	1,360	(2)	16
Ships, boats, and other vessels for scrapping		16	2,680	3	476
Used rails for rerolling and other uses, includes mixed (used plus new) rails		42	18,100	55	25,600
Iron ore		8,400	334,000	11,800	584,000
Lead:					
Base bullion, Pb content	metric tons	129	841	198	1,290
Ore and concentrates, Pb content	do.	292,000	157,000	390,000	190,000
Unwrought and alloys, Pb content	do.	58,600	50,100	45,500	46,100
Wrought and alloys, Pb content	do.	23,800	42,300	19,000	40,800
Scrap, gross weight	do.	56,300	14,800	67,300	21,600
Magnesium:					
Waste and scrap, Mg content	do.	4,790	11,300	5,630	13,100
Metal, Mg content	do.	1,760	3,830	732	2,470
Alloys, gross weight	do.	1,750	7,780	1,200	5,870
Powder, sheets, tubing, ribbons, wire, other forms, gross weight	do.	3,530	25,800	2,080	22,400
Manganese, gross weight:					
Ores and concentrates with 20% or more manganese	do.	123,000	12,400	13,500	3,940
Ferromanganese, all grades	do.	9,120	10,600	14,400	14,900
Silicomanganese	do.	502	632	899	1,220
Metal, including alloys and waste and scrap	do.	2,790	6,090	2,670	5,960
Dioxide	do.	4,000	3,680	5,900	5,040
Mercury:					
Metal	do.	278	2,310	319	5,810
Amalgams of precious metals whether or not chemically defined	do.	603	155,000	1,160	231,000
Molybdenum:					
Ore and concentrates, including roasted and other, Mo content	do.	46,200	358,000	46,400	1,450,000
Chemicals:					
Oxides and hydroxides, gross weight	do.	5,280	80,300	14,600	375,000
Molybdates, all, gross weight	do.	2,680	28,500	2,150	54,500
Ferromolybdenum, Mo content	do.	925	21,200	2,090	43,400
Other, includes powders, unwrought, bars and rods, waste and scrap, wire, other, gross weight	do.	1,520	66,000	2,030	139,000
Nickel, Ni content:					
Primary, unwrought and chemicals	do.	8,000	186,000	7,630	219,000
Secondary, stainless steel scrap and waste and scrap	do.	48,300	609,000	55,600	731,000
Wrought, not alloyed, bars, rods, profiles, wire, sheets, strip, foil, tubes, pipes	do.	1,120	16,400	1,340	26,700
Alloyed, unwrought ingot, bars, rods, profiles, wire, sheets, strip, foil, tubes, pipes, other alloyed articles, gross weight	do.	29,700	566,000	37,700	819,000
Platinum-group metals:					
Palladium, Pd content	kilograms	31,500 r	143,000 r	27,000	122,000
Platinum, includes waste and sponge, Pt content	do.	28,400 r	520,000 r	24,900	482,000
Iridium, osmium, ruthenium, gross weight	do.	1,090 r	8,800 r	1,070	7,190
Rhodium, Rh content	do.	314 r	7,900 r	615	28,900

See footnotes at end of table.

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TABLE 7—Continued

U.S. EXPORTS OF PRINCIPAL MINERALS AND PRODUCTS, EXCLUDING MINERAL FUELS[1]

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral or product		2004		2005	
		Quantity	Value	Quantity	Value
Metals—Continued:					
Rare earths, estimated rare-earth oxide content:					
Cerium compounds	kilograms	2,280,000	12,600	2,220,000	13,600
Compounds, inorganic and organic	do.	4,800,000	18,900	2,070,000	14,100
Metals, including scandium and yttrium	do.	1,010,000	6,050	636,000	5,180
Ferrocerium and other pyrophoric alloys	do.	3,720,000	16,800	4,320,000	18,000
Selenium, Se content	do.	160,000	2,820 r	254,000	3,040
Silicon, gross weight:					
Ferrosilicon	metric tons	11,500	11,700	13,400	13,400
Metal	do.	18,600	489,000	23,400	847,000
Silver:					
Bullion, Ag content	kilograms	302,000	64,500	166,000	45,900
Dore, Ag content	do.	79,800	18,800	132,000	35,000
Metal powder, gross weight	do.	708,000	122,000	809,000	139,000
Nitrate, gross weight	do.	61,500	5,720	56,600	4,180
Ores and concentrates, Ag content	do.	1,560	306	3,680	834
Semimanufactured forms containing 99.5% or more by weight of silver, gross weight	do.	269,000	48,300	308,000	54,500
Waste and scrap, gross weight	do.	2,240,000	424,000	2,880,000	576,000
Unwrought, other, gross weight	do.	39,600	8,690	20,500	5,280
Thallium, unwrought powders, waste and scrap, others	do.	1,190	276	252	102
Thorium and thorium-bearing materials, thorium ore, monazite concentrate, compounds	do.	731	298	737	281
Tin:					
Ingots and pigs	metric tons	3,650	25,700	4,330	30,500
Tin scrap and other tin bearing material, except tinplate scrap, includes rods, profiles, wire, powders, flakes, tubes, pipes	do.	16,800	42,900	32,800	51,200
Tinplate and terneplate	do.	262,000	169,000	252,000	188,000
Titanium:					
Metal, waste and scrap, unwrought, wrought products and castings, ferrotitanium and ferrosilicon titanium	do.	25,200	417,000 r	39,500	677,000
Ores and concentrates	do.	8,690	3,370	20,900	8,930
Pigment, dioxide and oxide	do.	635,000	1,090,000	524,000	1,060,000
Tungsten, W content:					
Ammonium paratungstate	do.	125	722	774	8,810
Carbide powder	do.	1,440 e	24,200	1,560 e	37,800
Metal powders	do.	433 e	18,700	750 e	28,500
Miscellaneous tungsten-bearing materials, ferrotungsten, ferrosilicon tungsten, unwrought, waste and scrap, wrought, compounds	do.	1,730	43,700	2,810	63,400
Ores and concentrates	do.	43 e	959	52 e	1,600
Vanadium:					
Aluminum-vanadium master alloy, gross weight	kilograms	14,600,000	32,200 r	15,100,000	45,600
Ferrovanadium, V content	do.	285,000	9,210	504,000	19,300
Metal, including waste and scrap, gross weight	do.	522,000	7,770 r	293,000	16,400
Pentoxide, anhydride, V content	do.	240,000 r	4,350 r	254,000	5,470
Other oxides and hydroxides, V content	do.	584,000 r	6,230	899,000	15,400
Zinc:					
Compounds, chloride, compounds, n.s.p.f., oxide, sulfate	do.	27,200	38,100	29,700	47,200
Ores and concentrates, Zn content	do.	745,000 r	413,000	786,000	477,000
Rolled	do.	9,770	12,700	8,760	10,400
Slab	do.	3,300	5,330	784	1,500
Zirconium:					
Ferrozirconium	do.	913	1,310	65	100
Ores and concentrates	do.	68,800	45,500	101,000	74,000
Oxide, includes germanium oxides and zirconium dioxides	do.	1,600	18,100	2,260	21,000
Unwrought powders	do.	138	2,600	175	3,620
Waste and scrap	do.	1,560	92,400	1,800	90,300
Total		XX	36,400,000 r	XX	28,900,000

See footnotes at end of table.

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TABLE 7—Continued

U.S. EXPORTS OF PRINCIPAL MINERALS AND PRODUCTS, EXCLUDING MINERAL FUELS[1]

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral or product		2004		2005	
		Quantity	Value	Quantity	Value
Industrial minerals:					
Abrasives, manufactured:					
Aluminum oxide, crude	kilograms	13,900	41,200	13,900	45,100
Metallic abrasives	do.	26,500	20,600	26,900	21,600
Silicon carbide, crude, round and refined	do.	13,900	14,600	15,600	17,400
Asbestos, includespreex orts:					
Manufactured	metric tons	NA	341,000	NA	374,000
Unmanufactured	do.	1,580	333,000	1,510	398,000
Barite, natural barium sulfate	do.	69,900	6,400	92,700	9,930
Boron minerals and compounds:					
Boricacid, includes orthoboric and anh drous		61	35,000	183	96,800
Sodium borates		135	60,200	308	110,000
Bromine:					
Compounds, includes methyl bromine and ethylene dibromide, Br content	metric tons	6,600	13,800	6,830	16,800
Elemental, gross weight	do.	2,840	2,070	2,710	3,990
Cement, hydraulic and clinker		818	63,000	803	68,300
Clays:					
Ball		107	8,200	141	8,840
Bentonite		915	105,000	847	98,500
Fire		332	32,300	368	34,400
Fuller's earth		49	10,300	55	13,500
Kaolin		3,640	600,000	3,580	601,000
Other, n.e.c., includes chamotte or dinas earth, activated clays and earths, artifically activated cla sp		586	181,000	634	173,000
Diamond:					
Gemstones, natural, including reexports	thousand carats	22,600 r	6,870,000 r	25,700	8,470,000
Industrial including exports and reexports:					
Unworked	do.	2,340	21,700	1,430	26,100
Powder, dust and grit, natural and synthetic	do.	97,900	51,600	104,000	59,300
Diatomite		143	53,700	142	60,400
Felds ar	metric tons	9,630	1,420	15,200	2,070
Fluors ar p	do.	20,600	3,200	36,100	7,840
Garnet, industrial[e]		11	8,990	13	9,700
Gray hite, natural and artificial	metric tons	94,900	118,000 r	56,200	109,000
Gypsum and gypsum products:					
Crude		149	15,000	148	16,400
Plasters		332	31,800	174	33,700
Boards		83	51,100	86	58,900
Other		XX	29,300	XX	33,000
Helium, Grade-A	million cubic meters	45	87,400	51	99,100
Iodine:					
Crude/resublimed	metric tons	1,270	11,800	2,660	27,900
Potassium iodide	do.	102 r	1,980 r	68	1,550
Iron oxide pigments and hydroxides:					
Pigment grade	do.	3,120	7,380	2,220	6,170
Other grade	do.	72,700	41,800	73,100	47,100
Kyanite, andalusite, sillimanite		35 r	6,200 r	35	7,200
Lime		100	14,300 r	133	17,500
Lithium chemicals:					
Carbonate	metric tons	3,910	12,200	4,190	13,700
Hydroxide	do.	5,780	20,000	5,620	20,100
Magnesium compounds:					
Compounds, chlorides, hydroxide and peroxide, sulfates	do.	41,100	18,100	32,700	19,500
Magnesite, crude and processed:					
Caustic-calcined magnesia	do.	3,720	2,200	4,920	2,500
Dead-burned and fused ma nesia	do.	29,900	17,300	24,900	11,400
Other ma nesia	do.	23,400 r	17,700 r	21,700	18,300
Crude	do.	19,500	2,250	21,800	2,490

See footnotes at end of table.

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TABLE 7—Continued

U.S. EXPORTS OF PRINCIPAL MINERALS AND PRODUCTS, EXCLUDING MINERAL FUELS[1]

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral or product		2004		2005	
		Quantity	Value	Quantity	Value
Industrial minerals—Continued:					
Mica:					
Scrap and flake:					
Powder	metric tons	7,200	4,780	7,140	4,860
Waste	do.	2,730	731	1,480	343
Sheet:					
Unworked	do.	29	58	74	269
Worked	do.	1,060 r	15,000 r	1,350	13,900
Peat		29	3,390	36	4,020
Perlite, crude[e]	metric tons	37,000	1,500	32,000	1,300
Pumice and pumicite		27	7,000	20	7,520
Salt		1,110	47,600	879	51,800
Sand and gravel:					
Construction:					
Sand		124	27,500	137	23,400
Gravel		553	4,610	382	4,800
Industrial		1,790	174,000	2,910	154,000
Silica, special stone products		NA	8,900	NA	10,000
Soda ash		4,670	514,000	4,680	640,000
Stone:					
Crushed		1,290 r	54,500	1,270	50,500
Dimension		XX	63,700	XX	66,100
Strontium compounds:					
Carbonate, precipitated	metric tons	360	266	66	196
Oxide, hydroxide, peroxide	do.	469	477	301	176
Sulfur:					
Elemental		949	63,300	684	55,200
Sulfuric acid, 100% H_2SO_4	metric tons	204,000	21,300	338,000	29,500
Talc, excludes powders, talcum (in package), face, compact		202	39,600	198	41,800
Vermiculite[e]		10	1,600	5	970
Wollastonite[e]	metric tons	12,500	3,750	7,000	2,100
Zeolites[e]	do.	1,000	200	5,000	1,000
Total		XX	10,400,000	XX	12,400,000
Grand total		XX	46,900,000 r	XX	41,400,000

[e]Estimated. [r]Revised. NA Not available. XX Not applicable.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Less than ½ unit.

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TABLE 8

U.S. IMPORTS FOR CONSUMPTION OF PRINCIPAL MINERALS AND PRODUCTS, EXCLUDING MINERAL FUELS[1]

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral or product		2004		2005	
		Quantity	Value	Quantity	Value
Metals:					
Aluminum:					
Crude and semicrude	metric tons	4,720,000	9,240,000	5,330,000	11,500,000
Manufactures	do.	288,000	756,000	337,000	964,000
Antimony:					
Metal	do.	8,270	19,100	6,370	20,400
Ore and concentrate, antimony content	do.	1,750	4,900	204	622
Oxide, antimon content y	do.	23,500	67,200	22,700	81,600
Arsenic:					
Acid	do.	22	32	9	50
Metal	do.	872	3,030	812	3,410
Sulfide	do.	(2)	2	--	--
Trioxide	do.	8,090	4,080	11,000	5,280
Bauxite and alumina:					
Alumina, calcined equivalent		1,650	533,000	1,860	639,000
Bauxite:					
Calcined, refractory and other grade		341	36,900	337	37,300
Crude and dried		10,000	186,000	9,850	246,000
Speciality aluminum compounds, sulfate, chloride, fluoride-based	metric tons	11,900	6,360	14,800	7,620
Beryllium, ore, concentrates, oxide, hydroxide, unwrought including powders, waste and scrap, other, beryllium-copper master alloys, beryllium-copper plates, sheets, strip[3]	kilograms	1,280,000	14,200	1,040,000	16,300
Bismuth, metallic	do.	1,980,000	14,500	2,530,000	20,500
Cadmium:					
Metal	do.	38,000	127	81,300	1,040
Sulfide, gross weight	do.	1,810	23	8,760	75
Chromium:					
Chromite ore	metric tons	153,000	17,500	165,000	23,100
Metals and alloys:					
Ferrochromium-silicon	do.	30,600	31,500	33,700	31,600
Metal, unwrought powders, waste and scrap, other	do.	9,630	56,000	11,000	87,700
Chemicals:					
Oxides, h droxides, trioxides and other	do.	9,960	18,900	14,600	32,600
Sulfates	do.	111	161	288	438
Salts of oxometallic or peroxometallic acids, zinc and lead chromate, sodium dichromate, potassium dichromate, other	do.	1,880	3,430	9,890	7,460
Carbide	do.	138	1,630	131	2,150
Pigments and preparations based on chromium	do.	7,540	20,200	7,510	22,100
Cobalt:					
Metal:					
Alloys, unwrought, waste and scrap, wrought, cobalt articles	do.	1,330	29,500	1,170	28,300
Unwrought, excluding alloys and waste and scrap, includes cathode and metal powder, may include intermediate products of cobalt metallurgy	do.	7,250	311,000	9,350	312,000
Oxide and h droxides	do.	1,300	45,100	1,310	35,100
Other forms, includes acetates, carbonates, chlorides, sulfates	do.	1,720	22,100	2,200	24,800
Columbium (niobium) and tantalum:					
Columbium:					
Ores and concentrates	do.	5	41	10	119
Oxide	do.	906	13,900	946	13,400
Ferrocolumbium	do.	7,950	69,000	8,360	71,700
Unwrought, alloys, metal, powder	do.	940	18,500	1,380	26,700
Tantalum:					
Ores and concentrates, includes synthetic concentrates	do.	1,480 r	57,900 r	1,250	43,700
Unwrought, waste and scrap, powders, alloys, metal	do.	1,060	138,000	1,160	105,000
Wrought	do.	38	10,000	78	17,100

See footnotes at end of table.

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TABLE 8—Continued
U.S. IMPORTS FOR CONSUMPTION OF PRINCIPAL MINERALS AND PRODUCTS, EXCLUDING MINERAL FUELS[1]

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral or product		2004 Quantity	2004 Value	2005 Quantity	2005 Value
Metals—Continued:					
Copper:					
Unmanufactured, does not include unalloyed scrap, copper content	metric tons	983,000	2,650,000	1,140,000	3,970,000
Semimanufactures	do.	390,000	1,270,000	524,000	1,940,000
Scrap, alloyed and unalloyed	do.	102,000	187,000	114,000	276,000
Ferroalloys not listed elsewhere:					
Ferrophosphorus	do.	7,280	1,840	NA	NA
Other	do.	8,520	12,700	NA	NA
Gallium:					
Unwrought and waste and scrap	kilograms	19,400	4,130	15,800	4,900
Gallium arsenide wafers, doped and undoped	do.	230,000	154,000	204,000	163,000
Germanium, wrought, unwrought, waste and scrap, gross weight	do.	9,130	7,260	16,700	11,200
Gold:					
Ores and concentrates	do.	1,860	19,200	1,630	18,900
Dore and precipitates	do.	142,000	1,590,000	234,000	2,060,000
Bullion, refined	do.	139,000	1,830,000	105,000	1,520,000
Waste and scrap	do.	20,500	161,000	27,300	209,000
Metal powder	do.	10,900	59,400	1,990	6,730
Compounds	do.	60,000	1,530	29,500	935
Indium, unwrought and waste and scrap	do.	143,000	58,800	142,000	94,300
Iron and steel:					
Steel mill products		32,500	21,400,000	29,200	NA
Fabricated steel products		4,740	8,260,000	5,120	NA
Cast iron and steel products		611	638,000	744	NA
Stainless steel	metric tons	560,000	2,490,000	585,000	NA
Iron and steel scrap:					
Ferrous, includes tinplate and ternplate, excludes used rails for rerolling and other uses and ships, boats, and other vessels for scrapping		4,660	1,230,000	3,840	909,000
Pig iron, all grades		6,400	1,360,000	6,030	1,580,000
Direct-reduced iron, steelmaking grade		2,450	463,000	2,170	361,000
Ships, boats, and other vessels for scrapping		(2)	128	(2)	208
Used rails for rerolling and other uses, includes mixed (used plus new) rails		131 r	44,100	164	62,800
Iron ore		11,800	371,000	13,000	532,000
Lead:					
Pigs and bars, Pb content	metric tons	197,000	175,000	298,000	303,000
Pigments and compounds, Pb content	do.	33,200	48,000	32,500	55,500
Scrap, reclaimed, includes ash and residues, Pb content	do.	4,780	3,510	3,340	2,880
Wrought, all forms, including wire and powders, gross weight	do.	11,000	25,200	11,900	28,900
Magnesium:					
Waste and scrap, gross weight	do.	11,700	17,600	14,700	22,700
Metal, gross weight	do.	34,300	78,200	28,700	80,700
Alloys, Mg content	do.	51,500	152,000	40,300	139,000
Powder, sheets, tubing, ribbons, wire, other forms, Mg content	do.	1,180 r	10,200	1,040	10,100
Manganese:					
Ores and concentrates with 20% or manganese, all grades, Mn content	do.	234,000	37,700	334,000	58,200
Ferromanganese, all grades, Mn content	do.	335,000 r	414,000 r	202,000	200,000
Silicomanganese, Mn content	do.	269,000	386,000	218,000	231,000
Metal, unwrought, other wrought, waste and scrap, gross weight	do.	34,700	49,900	33,400	57,500
Chemicals, manganese dioxide and potassium permanganate, gross weight	do.	27,600	33,000	32,600	41,600
Mercury:					
Metal	do.	92	1,350	212	2,530
Amalgams of precious metals whether or not chemically defined	do.	79 r	100,000	51	89,100
Molybdenum:					
Ores and concentrates, including roasted and other, Mo content	do.	8,780	268,000	11,900	746,000
Chemicals, gross weight:					
Oxides and hydroxides	do.	822	15,800	1,240	42,500
Molybdates, all	do.	2,200	19,800	4,320	54,800
Orange	do.	1,030	4,760	983	4,780

See footnotes at end of table.

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TABLE 8—Continued

U.S. IMPORTS FOR CONSUMPTION OF PRINCIPAL MINERALS AND PRODUCTS, EXCLUDING MINERAL FUELS[1]

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral or product		2004		2005	
		Quantity	Value	Quantity	Value
Metals—Continued:					
Molybdenum—Continued:					
Ferromolybdenum, Mo content	metric tons	5,310	158,000	4,050	278,000
Other, includes powders, unwrought, bars and rods, waste and scrap, wire, other, gross weight	do.	896	34,300	879	72,900
Nickel, Ni content:					
Primary, chemicals and unwrought	do.	136,000	1,890,000	143,000	2,060,000
Secondary, stainless steel scrap and waste and scrap	do.	18,800	250,000	15,500	223,000
Wrought, not alloyed, bars, rods, profiles, wire, sheets, strip, foil, tubes, pipes	do.	797	20,300	1,060	26,000
Alloyed, unwrought ingot, bars, rods, profiles, wire, sheets, strip, foil, tubes, pipes, other alloyed articles	do.	19,900	349,000	23,300	481,000
Platinum-group metals, metal content:					
Platinum, grains and nuggets, sponge, other unwrought, other, waste and scrap, coins	do.	86,400	2,200,000	106,000	2,280,000
Palladium, unwrought and other	do.	127,000	931,000	139,000	855,000
Iridium, unwrought and other forms	kilograms	3,230	18,000	3,010	16,700
Osmium, unwrought	do.	75	421	39	362
Ruthenium, unwrought	do.	18,800	35,900	23,200	49,800
Rhodium, unwrought and other forms	do.	13,200	397,000	13,600	821,000
Rare earths, estimated equivalent rare-earth oxide (REO) content:					
Cerium compounds, including oxides, hydroxides, nitrates, sulfate chlorides, oxalates	do.	1,880,000	13,200 r	2,170,000	10,600
Yttrium compounds content by weight greater than 19% but less than 85% oxide equivalent	do.	136,000	3,510	223,000	3,480
Compounds, including oxides, hydroxides, nitrates, other compounds except chlorides	do.	11,400,000	64,100	8,550,000	59,600
Mixtures of REO's except cerium oxide	do.	1,660,000	4,930	640,000	6,320
Metals, whether intermixed or alloyed	do.	804,000	3,500	880,000	4,900
Mixtures of rare-earth chlorides, except cerium chloride	do.	1,310,000	6,870	2,670,000	6,330
Ferrocerium and other pyrophoric alloys	do.	105,000	1,770	130,000	2,050
Rhenium:					
Metal	do.	11,800	12,900	21,800	23,300
Ammonium perrhenate	do.	12,100	7,560	10,300	7,040
Selenium and tellurium:					
Selenium, Se content:					
Selenium	do.	402,000	16,000	575,000	33,900
Dioxide	do.	10,300	293	14,100	1,190
Tellurium, Te content	do.	62,800	2,620	42,200	4,650
Silicon, gross weight:					
Ferrosilicon	metric tons	247,000	201,000	290,000	215,000
Metal	do.	167,000	314,000	157,000	366,000
Silver:					
Ash and residues, Ag content	kilograms	6,710	1,530	2,630	769
Bullion, Ag content	do.	3,410,000	728,000	3,880,000	902,000
Dore, Ag content	do.	346,000	117,000	300,000	89,500
Metal powder, gross weight	do.	27,400	6,920	28,400	6,840
Nitrate, gross weight	do.	--	--	201	30
Ores and concentrates, Ag content	do.	2,220	1,410	433	318
Semimanufactured forms containing 99.5% or more by weight of silver, gross weight	do.	52,300	11,900	181,000	39,800
Waste and scrap, gross weight	do.	2,020,000	160,000	3,640,000	126,000
Unwrought, other, gross weight	do.	342,000	69,600	357,000	80,400
Thallium, unwrought powders, waste and scrap, other	do.	325	117	235	33
Thorium and thorium-bearing materials, compounds	do.	5,320	170	4,930	145
Tin, gross weight:					
Compounds	metric tons	635	6,030	564	5,720
Dross, skimmings, scrap, residues, alloys, n.s.p.f.	do.	5,790	24,500	9,930	28,500
Metal, unwrought	do.	47,600	390,000	37,500	285,000
Miscellaneous, includes tinfoil, tin powder, flitters, metallics, manufactures, n.s.p.f.	do.	NA	7,080	NA	8,010
Tinplate and terneplate	do.	328,000	215,000	391,000	300,000
Tinplate scrap	do.	9,650	2,020	16,800	3,160

See footnotes at end of table.

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TABLE 8—Continued

U.S. IMPORTS FOR CONSUMPTION OF PRINCIPAL MINERALS AND PRODUCTS, EXCLUDING MINERAL FUELS[1]

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral or product		2004		2005	
		Quantity	Value	Quantity	Value
Metals—Continued:					
Titanium:					
Concentrate:					
Ilmenite	metric tons	244,000	40,900	154,000	20,400
Rutile, natural and synthetic	do.	360,000	165,000	366,000	158,000
Metal:[3]					
Waste and scrap	do.	8,830	53,600	12,400	162,000
Unwrou ht p	do.	11,900	79,900 r	15,800	120,000
Inpots	do.	1,530	14,800	2,450	38,700
Billets, bloom, sheet, bar, slab	do.	XX	XX	XX	XX
Powder	do.	142	2,840	126	4,060
Other	do.	959	8,350	1,330	22,900
Wrought products and castings, includes bar, castings, foil, pipe, plate, profile, rod, sheet, strip, tube, wire, other	do.	3,540 r	91,500	3,660	111,000
Ferrotitanium and ferrosilicon titanium	do.	6,940	21,200	16,900	76,700
Pigment, dioxide and oxide	do.	264,000	413,000	341,000	578,000
Titaniferous iron ore	do.	68,700	3,650	61,100	3,560
Titaniferous sla p	do.	457,000	192,000	667,000	254,000
Tungsten, W content:					
Ammonium paratungstate	do.	2,090	16,500	1,920	29,900
Ferrotungsten and ferrosilicon tungsten	do.	392	3,510	385	5,390
Miscellaneous tungsten-bearing materials, metal powders, carbide powder, unwrought, waste and scrap, wrought, oxides, calcium tungstate, other tungstates, other compounds	do.	5,750	92,400	6,760	164,000
Ores and concentrates	do.	2,310	14,600	2,080	31,400
Vanadium:					
Aluminum-vanadium master alloy, gross weight	kilograms	19,100	67	1,010	15
Ferrovanadium, V content	do.	3,020,000 r	62,100	11,900,000	131,000
Metal, including waste and scrap, gross weight	do.	31,200	1,710	54,800	3,800
Miscellaneous chemicals, sulfates and vanadates, V content	do.	74,700 r	1,150 r	85,100	2,800
Pentoxide, anhydride, V content	do.	1,040,000 r	8,600	1,370,000	52,900
Vanadium-bearing ash, residues, slag from the manufacture of iron and steel, V_2O_5 content	do.	4,200,000 r	11,800	3,020,000	12,400
Other oxides and h droxides, V content	do.	120,000 r	1,650	186,000	6,540
Zinc:					
Compounds, lithopone, chloride, compounds n.s.p.f., hydrosulfite, oxide, sulfate oxide, sulfate	metric tons	137,000	107,000	148,000	150,000
Ores and concentrates, Zn content	do.	231,000	98,700	156,000	117,000
Rolled	do.	2,500	9,250	3,630	11,900
Slab, refined	do.	812,000	888,000	668,000	875,000
Zirconium and hafnium:					
Hafnium, unwrought, including powders	do.	4	895	4	931
Zirconium:					
Ferrozirconium	do.	165	318	306	675
Ores and concentrates	do.	35,200	16,800	38,200	25,700
Oxide, includes germanium oxides and zirconium oxides	do.	3,690	33,000	3,160	33,300
Unwrought powder	do.	75 r	2,320	269	6,000
Waste and scrap	do.	722	45,600	755	64,900
Total		XX	69,000,000	XX	43,400,000
Industrial minerals:					
Abrasives, manufactured:					
Aluminum oxide, crude, ground and refined	do.	233,000 r	98,300 r	244,000	109,000
Metallic abrasives	do.	15,900	9,520	16,500	12,500
Silicon carbide, crude, ground and refined	do.	209,000	119,000	201,000	128,000
Asbestos:					
Chrysotile and other unspecified type	do.	3,450	806	2,530	1,420
Products with basis of asbestos, cellulose, or other minerals		NA	616,000	NA	580,000

See footnotes at end of table.

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TABLE 8—Continued

U.S. IMPORTS FOR CONSUMPTION OF PRINCIPAL MINERALS AND PRODUCTS, EXCLUDING MINERAL FUELS[1]

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral or product		2004		2005	
		Quantity	Value	Quantity	Value
Industrial minerals—Continued:					
Barite:					
Chemicals; chloride, oxide, hydroxide, peroxide, nitrate, precipitated carbonate	metric tons	18,200	14,600	14,100	16,600
Crude	do.	1,960,000	90,600	2,570,000	137,000
Ground	do.	5,100	700	84,000	8,250
Other sulfates	do.	33,800	17,800	28,600	16,000
Boron minerals and compounds:					
Borax		(2)	62	1	319
Boric acid		49	20,300	52	22,500
Colemanite		21	6,070	31	8,900
Ulexite		110	21,900	103	31,000
Bromine:					
Compounds, contained bromine	metric tons	6,600 r	13,800 r	6,830	16,800
Elemental	do.	2,840 r	2,070 r	2,710	3,990
Cement, hydraulic and clinker		27,300	1,140,000	33,700	1,560,000
Clays:					
China clay or kaolin	do.	205,000	38,600	262,000	40,200
Fire clay	do.	5,920	1,680	429	156
Decolorizing earths and fuller's earth	do.	227	48	2,460	286
Bentonite	do.	9,340	3,360	10,400	3,550
Common blue clay and other ball clay	do.	520	218	667	261
Other clay	do.	5,430	3,650	7,630	4,660
Chamotte or dina's earth	do.	2	2	3	9
Artifically activated clay and activated earth	do.	24,900	14,200	16,000	10,300
Diamond, industrial:					
Diamond stones, natural and miners'	thousand carats	1,780	13,800	2,120	29,500
Powder, dust and grit, natural and synthetic	do.	240,000	61,200	284,000	77,300
Diatomite	metric tons	1,710	488	4,480	1,280
Feldspar and nepheline syenite:					
Feldspar	do.	20,600	944	26,200	1,700
Nepheline syenite	do.	350,000	29,000	340,000	33,800
Fluorspar:					
Aluminum fluoride	do.	4,700	3,750	4,250	4,170
Cryolite	do.	3,860	3,660	3,110	3,260
Fluorspar	do.	599,000	95,300	629,000	122,000
Hydrofluoric acid, HF	do.	128,000	131,000	137,000	138,000
Garnet, industrial[e]		37	4,260	42	5,910
Gemstones		XX	15,500,000	XX	17,200,000
Graphite:					
Natural	metric tons	63,700	29,900	64,500	34,700
Electric furnace electrodes	do.	86,400	144,000	81,200	157,000
Gypsum:					
Crude		10,100	97,200	11,200	113,000
Plasters		5	3,420	6	4,350
Boards		617	87,100	739	129,000
Other		XX	43,200	XX	41,100
Iodine:					
Crude	metric tons	5,700	75,300	6,250	105,000
Potassium iodide	do.	678 r	11,500	458	9,970
Iron oxide pigments:					
Natural	do.	4,100	2,100	5,230	2,590
Synthetic	do.	166,000	114,000	188,000	138,000
Kyanite, andalusite, sillimanite	do.	4,010	1,420	6,300	2,410
Lime		232	25,900	310	33,000
Lithium chemicals:					
Carbonate	metric tons	15,400	26,500	18,900	27,500
Hydroxide	do.	64	233	124	453

See footnotes at end of table.

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TABLE 8—Continued

U.S. IMPORTS FOR CONSUMPTION OF PRINCIPAL MINERALS AND PRODUCTS, EXCLUDING MINERAL FUELS[1]

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral or product		2004		2005	
		Quantity	Value	Quantity	Value
Industrial minerals—Continued:					
Magnesium compounds:					
Compounds, chlorides, hydroxide, peroxide, sulfates	metric tons	132,000	40,600	119,000	34,800
Magnesite, crude and processed:					
Caustic-calcined magnesia	do.	157,000	22,200	152,000	23,900
Dead-burned and fused magnesia	do.	418,000	109,000	478,000	124,000
Other magnesia	do.	15,700	10,800	18,300	11,300
Crude	do.	15,900	1,980	15,000	2,260
Mica:					
Scrap and flake:					
Powder	do.	22,300	10,800	21,400	10,100
Waste	do.	1,420 r	659 r	900	365
Sheet:					
Unworked, excludes unworked sheet mica valued at less than $1 per kilogram	do.	124	358	53	202
Worked	do.	1,280	11,800	1,340	12,900
Nitrogen, major compounds, gross weight[3]		16,000	3,580,000	18,000	4,670,000
Peat moss	metric tons	786,000	159,000	891,000	195,000
Perlite, processed crude	do.	238,000	9,660	196,000	7,970
Phosphate rock and phosphatic materials		2,690	178,000	2,730	203,000
Potash, chloride, sulfate, nitrate, sodium nitrate mixtures	metric tons	8,140,000	751,000 r	8,110,000	1,170,000
Pumice:					
Crude or unmanufactured		401	31,400	239	31,800
Wholly or partially manufactured		1	3,660	1	5,750
Salt		11,900	159,000	12,100	180,000
Sand and gravel:					
Construction		4,760	56,900	7,160	86,800
Industrial		490	12,400	711	18,200
Silica, special stone products		NA	6,800	NA	7,700
Soda ash		6	1,880	8	2,460
Stone:					
Crushed, chips, calcium carbonate fines, excludes precipitated carbonates		18,600 r	179,000 r	21,000	194,000
Dimension		NA	1,790,000	NA	2,180,000
Strontium:					
Carbonate	metric tons	23,600	8,430	17,900	6,930
Celestite	do.	6,290	332	1,820	98
Metal	do.	217	1,070	770	2,210
Nitrate	do.	527	798	714	637
Oxide, hydroxide, peroxide	do.	98	76	9	38
Sulfur:					
Elemental		2,850 e	76,800	2,820 e	70,500
Sulfuric acid, 100% H_2SO_4	metric tons	2,400,000	104,000	2,680,000	122,000
Talc		226	58,400	237	55,600
Vermiculite[e]		69	13,000	91	17,000
Wollastonite[e]	metric tons	4,500	563	6,000	750
Total		XX	26,100,000	XX	30,600,000
Grand total		XX	95,100,000	XX	73,900,000

[e]Estimated. [r]Revised. NA Not available. XX Not applicable. -- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Less than ½ unit.

[3]Category regrouped in 2004; see commodity chapter for details.

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TABLE 9
WORLD AND U.S. PRODUCTION OF SELECTED NONFUEL MINERAL COMMODITIES[1]

(Thousand metric tons unless otherwise specified)

Mineral or product		World total					United States	
		2001	2002	2003	2004	2005	2005	Percentage of world total
Metals:								
Aluminum[2]		24,300	26,100	28,000 r	29,900 r	31,900	2,480	7.8
Antimony	metric tons	157,000	114,000 r	115,000 r	129,000 r	139,000	--	--
Arsenic trioxide[3]	do.	63,000 r	62,500 r	62,400 r	52,700 r	52,500	--	--
Bauxite[3, 4, 5]		137,000	144,000	153,000 r	160,000 r	169,000	NA	NA
Beryl[3]	metric tons	2,990	2,540	2,690 r	2,770 r	3,440	2,780	80.8
Bismuth, refinery	do.	5,820 r	6,730 r	8,740 r	10,500 r	11,900	--	--
Cadmium, refinery	do.	20,000 r	18,000 r	18,500	18,700 r	19,400	1,065	5.5
Chromite[3]		12,200 r	14,600 r	15,400 r	17,700 r	19,300	--	--
Cobalt, Co content:								
Mine	metric tons	44,800 r	50,600 r	50,800 r	57,100 r	57,900	--	--
Refinery	do.	38,700 r	40,800 r	43,800	49,100	54,900	--	--
Columbium (niobium)-tantalum concentrates[3]	do.	76,600	81,200	80,800	67,500 r	67,200	--	--
Copper:								
Mine		13,700	13,700	13,700	14,700 r	15,100	1,140	7.6
Refine ry		15,700 r	15,500 r	15,300 r	15,900 r	16,600	1,260	7.6
Gold	kilograms	2,560,000	2,550,000	2,560,000 r	2,440,000 r	2,470,000	256,000	10.4
Iron ore[3]		1,050,000 r	1,100,000 r	1,220,000 r	1,360,000 r	1,530,000	54,400	3.5
Iron and steel:								
Direct-reduced iron[2]		39,000 r	43,700 r	45,300 r	48,000 r	49,200	220	0.4
Pig iron[2]		585,000	610,000	666,000 r	713,000 r	789,000	37,200	4.7
Raw steel		853,000	906,000	972,000	1,060,000 r	1,120,000	93,300	8.3
Lead:								
Mine	metric tons	3,050,000 r	2,840,000 r	3,140,000	3,110,000	3,270,000	426,000	13.0
Refine ry	do.	6,600,000 r	6,780,000 r	6,780,000 r	6,950,000 r	7,470,000	1,280,000	17.2
Magnesium[5]	do.	420,000 r	440,000 r	485,000 r	595,000 r	626,000	W	NA
Magnanese ore[3]		20,900	22,200	24,100	27,700 r	29,100	--	--
Mercn [5]	metric tons	1,500	1,490	1,370 r	1,890 r	1,680	NA	NA
Molybdenum, Mo content	do.	133,000 r	122,000 r	131,000 r	159,000 r	185,000	58,000	31.3
Nickel, Ni content:								
Mine	do.	1,350,000	1,350,000 r	1,370,000 r	1,400,000 r	1,480,000	--	--
Refinery	do.	1,190,000 r	1,200,000 r	1,220,000	1,270,000 r	1,300,000	--	--
Platinum-group metals	kilograms	410,000 r	430,000 r	465,000 r	492,000 r	515,000	17,200	3.3
Selenium[2, 5]	do.	1,420,000 r	1,370,000 r	1,440,000 r	1,330,000	1,390,000	W	NA
Silver	metric tons	18,700 r	18,800 r	18,800 r	19,800 r	20,200	1,230	6.1
Tellurium[2, 5]	kilo rams	109,000	89,300	95,200	124,000 r	119,000	W	NA
Tin:								
Mine	metric tons	246,000 r	233,000 r	258,000 r	298,000 r	292,000	--	--
Smelter[6]	do.	289,000 r	280,000	280,000	309,000	349,000	11,800	3.4
Tun sten, W content	do.	50,800 r	66,100 r	68,200 r	69,400 r	70,100	--	--
Zinc:								
Mine	do.	8,930,000 r	8,550,000 r	9,470,000 r	9,460,000 r	9,800,000	748,000	7.6
Smelter		9,320 r	9,720 r	9,900 r	10,400 r	10,700	309	2.9
Industrial minerals:								
Asbestos	metric tons	2,060,000 r	2,320,000 r	2,360,000 r	2,360,000 r	2,400,000	--	--
Barite	do.	6,780,000 r	6,490,000 r	6,790,000 r	7,440,000 r	7,870,000	489,000 [7]	6.2
Boron minerals	do.	4,730,000	4,590,000 r	4,730,000 r	5,070,000 r	4,910,000	1,150,000 [7]	23.4
Bromine	thousand kilograms	509,000 r	503,000 r	488,000 r	544,000 r	555,000	226,000 [7]	40.8
Celesite	metric tons	399,000 r	435,000	471,000	457,000 r	494,000	--	--
Cement, hydraulic		1,740,000 r	1,850,000	2,030,000 r	2,190,000 r	2,310,000	100,900 [8]	4.4
Clays:								
Bentonite		10,400	10,300	10,500 r	11,500 r	11,700	4,710	40.3
Fuller's earth	metric tons	4,600,000	5,520,000 r	6,280,000 r	5,890,000 r	5,610,000	2,990,000	53.3
Kaolin		44,900 r	43,000 r	44,100 r	44,200 r	44,700	7,800	17.5
Diamond, natural	thousand carats	127,000	141,000 r	158,000 r	182,000 r	183,000	--	--
Diatomite	metric tons	2,000,000 r	1,950,000 r	1,950,000 r	1,950,000 r	2,020,000	653,000 [7]	32.3

See footnotes at end of table.

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TABLE 9—Continued
WORLD AND U.S. PRODUCTION OF SELECTED NONFUEL MINERAL COMMODITIES[1]

(Thousand metric tons unless otherwise specified)

Mineral or product		World total					United States	
		2001	2002	2003	2004	2005	2005	Percentage of world total
Industrial minerals—Continued:								
Feldspar		11,800 r	12,000 r	12,200 r	12,600 r	12,900	748	5.8
Fluorspar	metric tons	4,600,000 r	4,430,000 r	4,910,000 r	5,220,000 r	5,260,000	--	--
Graphite, natural	do.	816,000 r	932,000 r	999,000 r	1,020,000 r	1,050,000	--	--
Gypsum		105,000	107,000 r	110,000 r	112,000 r	118,000	21,100	17.9
Iodine, crude	thousand kilograms	20,700	21,000	22,900 r	24,800 r	25,400	1,570	6.2
Lime		121,000	120,000 r	125,000 r	127,000 r	127,000	20,000 [7,8]	15.7
Magnesite, crude[5]		11,100	13,600	14,000	14,700 r	14,300	W	NA
Mica, including scrap and flake[9]	metric tons	368,000	269,000	271,000 r	319,000 r	294,000	78,100	26.6
Nitrogen, N content of ammonia		105,000	109,000	110,000	117,000	121,000	8,040 [10]	6.6
Peat		23,200 r	26,200 r	25,200 r	26,400 r	26,400	685	2.6
Perlite	metric tons	1,730,000	1,810,000 r	1,810,000 r	1,860,000 r	1,950,000	508,000 [7]	26.1
Phosphate rock[3]		126,000	135,000	138,000 r	141,000	147,000	36,100	24.5
Potash, K_2O equivalent		26,400	26,800 r	28,400	30,400 r	31,100	1,200	3.9
Pumice		15,600 r	16,200 r	16,600 r	17,700 r	17,500	1,270 [7]	7.2
Salt		214,000 r	212,000 r	218,000 r	229,000 r	238,000	45,200 [8]	19.0
Sand and gravel, industrial, silica		113,000 r	113,000	115,000 r	117,000 r	118,000	30,600 [7]	25.9
Soda ash, natural and manufactured		35,700 r	37,200 r	38,400 r	40,300 r	41,900	11,000 [11]	26.2
Sulfur, all forms		61,400 r	62,600 r	64,200 r	66,000 r	66,000	9,460	14.3
Talc and pyrophyllite[12]	metric tons	8,780,000 r	7,590,000 r	8,100,000 r	8,230,000 r	8,250,000	856,000	10.4
Titanium concentrates:[3]								
Ilmenite and leucoxene	do.	5,130,000 r	5,470,000 r	5,720,000 r	5,640,000	5,840,000	500,000 [13]	8.6
Rutile[5]	do.	421,000	446,000	361,000	354,000 r	369,000	(14)	NA
Vermiculite	do.	431,000	497,000 r	491,000	516,000 r	527,000	100,000	19.0

rRevised. NA Not available. W Withheld to avoid disclosing company proprietary data; not included in "World" total. -- Zero.
[1]Data are rounded to no more than three significant digits.
[2]Primary.
[3]Gross weight.
[4]Individual country figures that are included in the world total represent dried bauxite equivalent of crude ore, but for some countries available data are insufficient to permit this adjustment.
[5]"World total" for years listed does not include U.S. production.
[6]Includes tin content of alloys made directly from ore.
[7]Quantity sold or used by producers.
[8]Includes Puerto Rico.
[9]Excludes, if any, U.S. production of low-quality sericite and sheet mica.
[10]Synthetic anhydrous ammonia; excludes coke oven byproduct ammonia.
[11]U.S. production is natural only.
[12]Data for the United States exclude proprietary pyrophyllite production.
[13]Includes rutile to avoid disclosing company proprietary data. Rounded to one significant digit.
[14]Included with ilmenite to avoid disclosing company proprietary data; not included in "Total."

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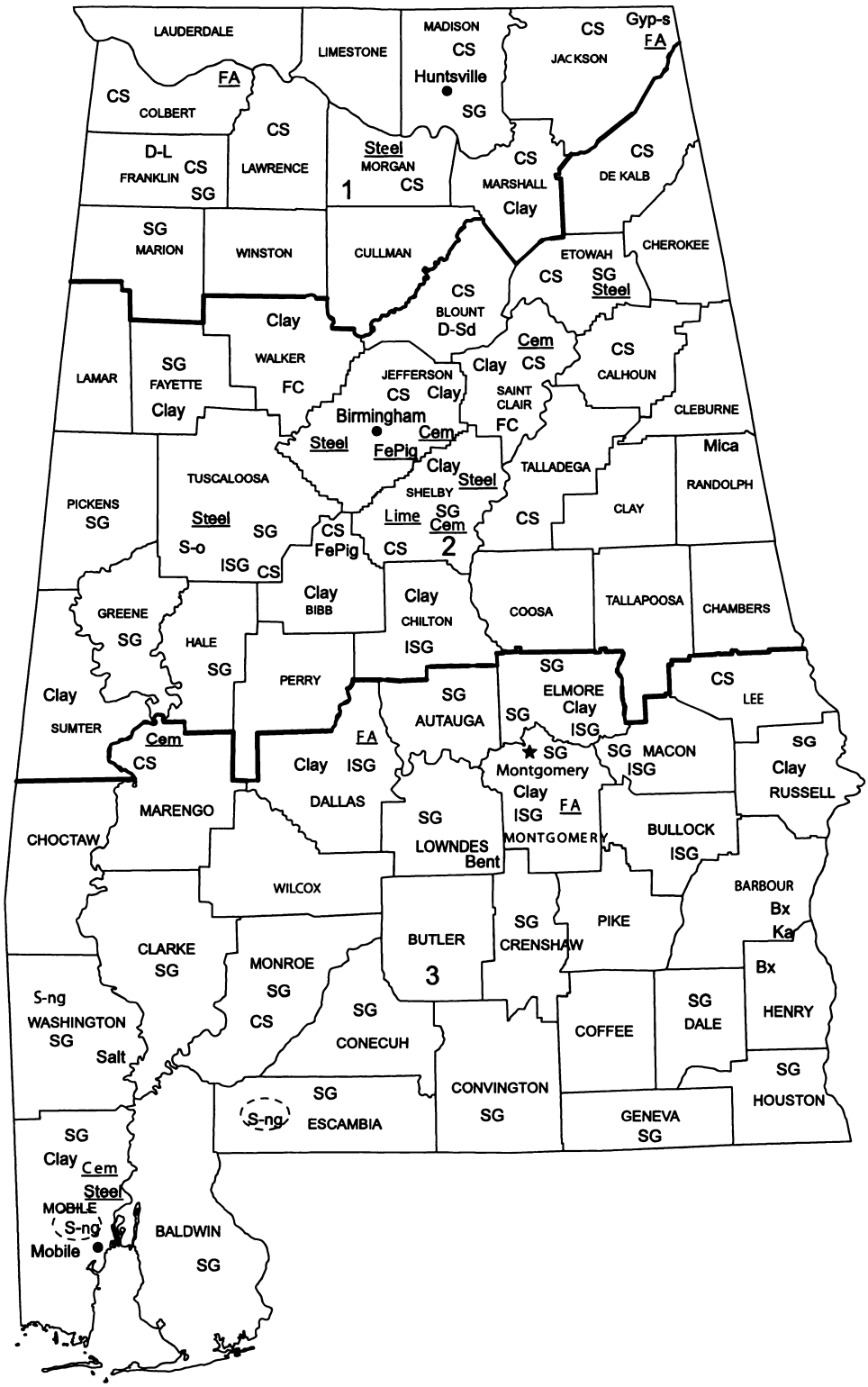
ALABAMA



LEGEND

- County boundary
- ★ Capital
- ● City
- 1 Crushed stone/sand and gravel districts

MINERAL SYMBOLS
(Major producing areas)

Bent	Bentonite
Bx	Bauxite
Clay	Common clay
Cem	Cement plant
CS	Crushed stone
D-L	Dimension limestone
D-Sd	Dimension sandstone
FA	Ferroalloys plant
FC	Fire clay
FePig	Iron oxide pigments
FePig	Iron oxide pigment plant
Gyp-s	Synthetic gypsum
ISG	Industrial sand and gravel
Ka	Kaolin
Lime	Lime plant
Mica	Mica
S-ng	Sulfur (natural gas)
S-o	Sulfur (oil)
Salt	Salt
SG	Construction sand and gravel
Steel	Steel plant
	Concentration of mineral operations

0 50 Kilometers

Source: Geological Survey of Alabama/U.S. Geological Survey (2005)

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The Mineral Industry of Alabama

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Geological Survey of Alabama for collecting information on all nonfuel minerals.

In 2005, Alabama's nonfuel mineral production was valued[1] at $1.12 billion, based upon annual U.S. Geological Survey (USGS) data. This was a 16.1% increase compared with that of 2004 following a 7.2% increase from 2003 to 2004. The State ranked 20th among the 50 States in total nonfuel mineral production value and accounted for more than 2% of the U.S. total.

The top four nonfuel mineral commodities produced in Alabama in 2005 continued to be, in descending order of value, cement (portland and masonry), crushed stone, lime, and construction sand and gravel. These four commodities accounted for 94% of the State's total nonfuel mineral production value; the combined value of cement and crushed stone represented nearly 72% of the total.

Most of Alabama's nonfuel minerals increased in production value in 2005. Leading in the State's rise in value were increases in the values of cement overall (portland and masonry), crushed stone, and lime (while the quantity produced decreased), up about $106 million, $29 million, and $17 million, respectively (table 1).

Nonfuel mineral production in Alabama consisted entirely of industrial minerals. Alabama continued to be third in the quantities of lime it produced, third of four iron oxide pigment-producing States, and fourth in bentonite, seventh in portland cement, and eighth in salt. The State rose to 2d in rank in mica production with the opening of a new operation, to 2d from 3d in common clays, to 4th from 5th in masonry cement, and to 9th from 10th in gemstones (based upon value), while it decreased to third from second in kaolin. Additionally, Alabama was the producer of substantial quantities of, in descending order of value, crushed stone, construction sand and gravel, and industrial sand and gravel. All metal production in the State, especially that of raw steel, was the result of processing materials acquired from other domestic and foreign sources. Production of a natural mixture of bauxite (no longer used to produce primary aluminum) and bauxitic clay with very low iron oxide content has been reported to the USGS since 1995 as kaolin; it is primarily used to make refractory products.

The narrative information that follows was provided by the Geological Survey of Alabama[2] (GSA).

Exploration and Development

Mineral exploration in Alabama continued to focus on industrial mineral resources with several large expansions of operations happening in the State (including crushed stone, cement, brick/tile, lime, and calcium carbonate).

Commodity Review

Industrial Minerals

In 2005, 166 companies or operations were involved in the mining and production of industrial mineral resources in Alabama. This included 50 limestone-dolomite operations for crushed stone that were active in the State. In addition, granite, marble, quartzite, and sandstone, operations for crushed stone were active in the State. New granite crushed stone quarries were operating in Lee and Randolph Counties.

The GSA reported another year of record crushed stone production for Alabama with more than 49.5 million metric tons (Mt) produced in the State. Birmingham-based Vulcan Materials Co. remained the leading construction aggregate producer in the country. Marble operations were active for the production of micronized calcium carbonate and building stone. Alabama had 20 active clay (bentonite, common clay, fire clay, fuller's earth, kaolin, and shale) operations. Clay production was lead by common clay followed by shale, fuller's earth, bentonite, fireclay, and kaolin.

Alabama had 76 active sand and gravel operations. Sand and gravel production came primarily from alluvium and terrace deposits in Elmore, Macon, Montgomery, Russell, and Tuscaloosa Counties and from the Citronelle Formation in Mobile County.

Other industrial mineral operations included bauxitic clays, building stone (limestone and sandstone), chalk, recovered sulfur, salt (solution recovery), and silicon.

A mica recovery operation that began production in 2004 continued operations at Micaville, Randolph County. Muscovite flake mica occurs as finely disseminated flakes in the mica schist of the northern Alabama Piedmont. Scrap or flake mica is used by industry in dry-, wet-, or micronized-ground form.

Government Activities and Programs

The largest beach renourishment project along coastal Alabama was continued in 2005 by the City of Gulf Shores which initiated a $25 million project in 2003 to pump sand from the bottom of Little Lagoon to the Gulf of Mexico shoreline along nearby West Beach. An estimated 15% to 30% of the sand that was added was displaced by Hurricane Katrina (Dezember, 2005).

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[1]The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2005 USGS mineral production data published in this chapter are those available as of December 2006. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—can be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

[2]Lewis S. Dean, a Geologist in the Economic Geology Division at the Geological Survey of Alabama, authored the text of the State mineral industry information provided by that agency.

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The Alabama Department of Transportation (ADOT) has an annual maintenance and construction program for nearly 18,000 kilometers of highway. This work represents one of the largest uses of asphaltic and bituminous base, concrete, and stone and gravel aggregate in the State. A revised listing of approved sources of coarse and fine aggregates is available from the ADOT (Alabama Department of Transportation, 2006§[3]).

In 2005, the GSA continued to publish 1:24,000-scale geologic maps in Alabama in conjunction with the STATEMAP program. STATEMAP is a component of the Congressionally mandated USGS National Cooperative Geological Mapping Program (NCGMP), which the USGS distributes Federal funds to support geologic mapping efforts through a competitive funding process. The NCGMP has three primary components: (1) FEDMAP, which funds Federal geologic mapping projects, (2) STATEMAP, which is a matching-funds grant program with State geological surveys, and (3) EDMAP, a matching-funds grant program with universities that has a goal to train the next generation of geologic mappers. This new geologic map information is being used in a variety of ways in these rapidly urbanizing parts of the State. For example, geologic mapping aids in the identification of supplies of industrial mineral resources (sand, gravel, and crushed stone) that support construction and infrastructure development. Published geologic 7.5-minute quadrangles during 2005 included the Greenbrier and Mason Ridge quads in the Limestone and the Madison County areas of the Tennessee Valley and the Vincent and Talladega quads in the Shelby, the St. Clair, and the Talladega County areas of the Valley and Ridge geologic province.

More information on geology, hydrology, mineral occurrence, mining history, and general economics of specific mineral resources in Alabama is available from the Geological Survey of Alabama. Much of this information, as well as contact information, are available over the Internet at http://www.gsa.state.al.us.

[3]A reference that includes a section mark (§) is found in the Internet Reference Cited section.

Reference Cited

Dezember, Ryan, 2005, Beach rebuilding to resume—Estimates between 15 percent and 30 percent of added sand displaced by Hurricane Katrina: Mobile Register, September 11, p. 6.

Internet Reference Cited

Alabama Department of Transportation, 2006, List I – 1 Sources of Course and Fine Aggregates, accessed on December 17, 2006, at URL http://www.dot.state.al.us/NR/rdonlyres/63C54970-7695-4DFD-8582-E574DDFA7153/0/Li01.pdf.

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN ALABAMA[1,2]

(Thousand metric tons and thousand dollars)

Mineral	2003		2004		2005	
	Quantity	Value	Quantity	Value	Quantity	Value
Cement:						
Masonry	565	55,700 e	430	49,400 e	475	54,800 e
Portland	4,330	273,000 e	4,800	320,000 e	5,120	421,000 e
Clays:						
Bentonite	125	3,810	100	3,050	109	3,480
Common	1,920	24,000	2,120	29,600	2,280	29,000
Gemstones	NA	356	NA	356	NA	371
Lime	2,290	151,000	2,280	164,000	2,240	181,000
Sand and gravel:						
Construction	14,500	67,600	14,700	65,300	15,700	70,500
Industrial	723	9,180	643	9,800	710	11,200
Stone, crushed	49,300	286,000	47,800 r	296,000 r	49,500	325,000
Combined values of clays (kaolin), iron oxide pigments (crude), mica [crude (2004)], salt, stone (dimension marble and sandstone)	XX	30,000	XX	27,000	XX	27,000
Total	XX	900,000	XX	965,000 r	XX	1,120,000

eEstimated. rRevised. NA Not available. XX Not applicable.

[1]Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

[2]Data are rounded to no more than three significant digits; may not add to totals shown.

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TABLE 2
ALABAMA: CRUSHED STONE SOLD OR USED, BY KIND[1]

Kind	2004 Number of quarries	2004 Quantity (thousand metric tons)	2004 Value (thousands)	2005 Number of quarries	2005 Quantity (thousand metric tons)	2005 Value (thousands)
Limestone	50 r	40,000 r	$237,000 r	51	41,000	$269,000
Dolomite	3	1,600	10,200	3	W	W
Marble	2	W	W	2	2,750	18,200
Sandstone	10 r	1,530	8,250	8	1,290	7,690
Granite	2	1,280	8,410	2	1,830	12,600
Slate	2	652	3,800	2	561	3,650
Miscellaneous stone	1	W	W	3	50	436
Total	XX	47,800 r	296,000 r	XX	49,500	325,000

rRevised. W Withheld to avoid disclosing company proprietary data; included in "Total."
XX Not applicable.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.

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TABLE 3
ALABAMA: CRUSHED STONE SOLD OR USED BY PRODUCERS
IN 2005, BY USE[1]

(Thousand metric tons and thousand dollars)

Use	Quantity	Value
Construction:		
Coarse aggregate (+1½ inch):		
Riprap and jetty stone	211	1,500
Other coarse aggregates	1,130	8,760
Total	1,340	10,300
Coarse aggregate, graded:		
Concrete aggregate, coarse	1,210	7,750
Bituminous aggregate, coarse	2,490	15,900
Bituminous surface-treatment aggregate	W	W
Other graded coarse aggregates	7,990	53,200
Total	11,700	76,900
Fine aggregate (-⅜ inch):		
Stone sand, concrete	(2)	(2)
Stone sand, bituminous mix or seal	269	1,760
Screening, undesignated	140	951
Other fine aggregates	2,410	13,300
Total	2,820	16,000
Coarse and fine aggregates:		
Graded road base or subbase	1,680	9,020
Unpaved road surface	217	916
Crusher run or fill or waste	138	925
Roofing granules	(3)	(3)
Other coarse and fine aggregates	8,870	61,000
Total	10,900	71,800
Other construction materials	478	3,020
Agricultural:		
Agricultural limestone	(4)	(4)
Other agricultural uses	(4)	(4)
Total	532	2,810
Chemical and metallurgical:		
Cement manufacture	2,680	15,200
Lime manufacture	(5)	(5)
Flux stone	(5)	(5)
Special:		
Mine dusting or acid water treatment	(5)	(5)
Other fillers or extenders	(5)	(5)
Unspecified:[6]		
Reported	11,400	78,300
Estimated	5,300	34,000
Total	16,700	113,000
Grand total	49,500	325,000

W Withheld to avoid disclosing company proprietary data; included with "Other graded coarse aggregate."

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Withheld to avoid disclosing company proprietary data, included with "Other fine aggregate."

[3]Withheld to avoid disclosing company proprietary data, included with "Other coarse and fine aggregates."

[4]Withheld to avoid disclosing company proprietary data; included in "Total."

[5]Withheld to avoid disclosing company proprietary data; included in "Grand total."

[6]Reported and estimated production without a breakdown by end use.

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TABLE 4
ALABAMA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2005, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Construction:						
Coarse aggregate (+1½ inch)[2]	W	W	W	W	W	W
Coarse aggregate, graded[3]	W	W	6,610	43,300	W	W
Fine aggregate (-⅜ inch)[4]	1,080	6,700	W	W	W	W
Coarse and fine aggregates[5]	W	W	5,580	35,300	W	W
Other construction materials	478	3,020	--	--	--	--
Agricultural[6]	W	W	W	W	W	W
Chemical and metallurgical[7]	--	--	W	W	W	W
Special[8]	--	--	W	W	--	--
Unspecified:[9]						
Reported	--	--	7,500	51,200	3,940	27,200
Estimated	1,700	11,000	3,600	24,000	--	--
Total	13,600	84,900	30,900	200,000	5,000	40,500

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes riprap and jetty stone and other coarse aggregates.

[3]Includes concrete aggregate (coarse), bituminous aggregate (coarse), bituminous surface-treatment aggregate, and other graded aggregates.

[4]Includes screening (undesignated), stone sand (concrete), stone sand bituminous mix or seal, and other fine aggregates.

[5]Includes crusher run or fill or waste, graded road base or subbase, roofing granules, unpaved road surface, and other coarse and fine aggregates.

[6]Includes agricultural limestone and other agricultural uses.

[7]Includes cement and lime manufacture and flux stone.

[8]Includes mine dusting or acid water treatment and other fillers or extenders.

[9]Reported and estimated production without a breakdown by end use.

TABLE 5
ALABAMA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2005, BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	8,780	$36,700	$4.19
Plaster and gunite sands	177	1,110	6.27
Concrete products (blocks, bricks, pipe, decorative, etc.)	74	526	7.10
Asphaltic concrete aggregates and other bituminous mixtures	1,380	10,100	7.34
Road base and coverings	656	1,900	2.89
Road and other stabilization (cement and lime)	26	116	4.46
Fill	914	2,290	2.50
Snow and ice control	11	34	3.09
Other miscellaneous uses[2]	582	3,350	5.76
Unspecified:[3]			
Reported	497	2,340	4.71
Estimated	2,650	12,000	4.52
Total or average	15,700	70,500	4.48

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes filtration.

[3]Reported and estimated production without a breakdown by end use.

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TABLE 6

ALABAMA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2005, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products[2]	487	2,860	789	3,560	7,750	32,000
Asphaltic concrete aggregates and road base materials[3]	216	2,180	94	244	1,750	9,680
Fill	8	23	9	98	897	2,170
Other miscellaneous uses[4]	43	201	166	1,660	383	1,530
Unspecified:[5]						
Reported	361	1,750	36	200	99	449
Estimated	128	577	235	1,060	2,290	10,300
Total	1,240	7,590	1,330	6,820	13,200	56,100

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes plaster and gunite sands.

[3]Includes road and other stabilization (cement and lime).

[4]Includes filtration and snow and ice control.

[5]Reported and estimated production without a breakdown by end use.

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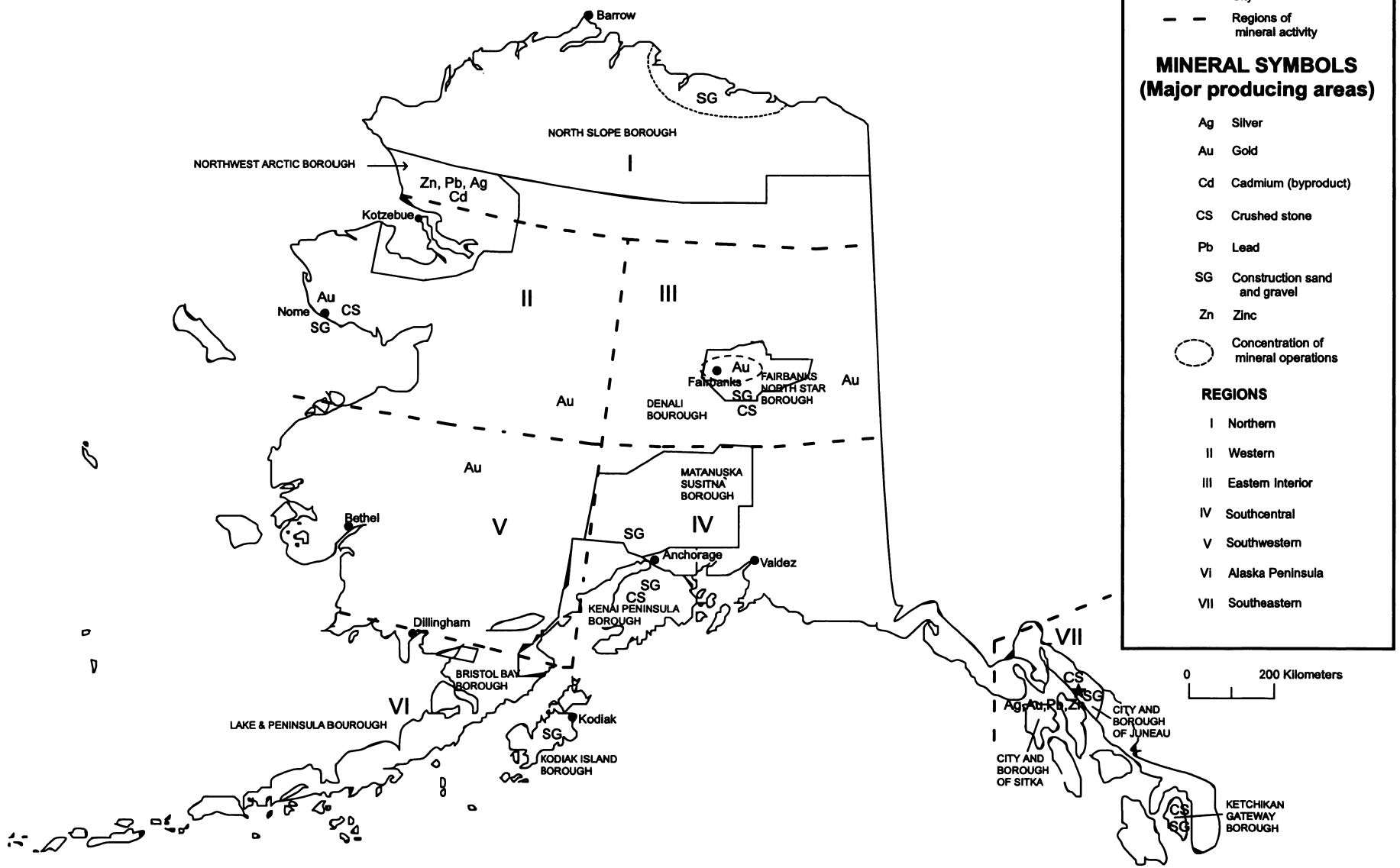
ALASKA



LEGEND

- Borough boundary
- Capital
- City
- Regions of mineral activity

MINERAL SYMBOLS (Major producing areas)

Ag	Silver
Au	Gold
Cd	Cadmium (byproduct)
CS	Crushed stone
Pb	Lead
SG	Construction sand and gravel
Zn	Zinc
	Concentration of mineral operations

REGIONS

I	Northern
II	Western
III	Eastern Interior
IV	Southcentral
V	Southwestern
Vi	Alaska Peninsula
VII	Southeastern

Source: Alaska Division of Geological and Geophysical Surveys/U.S. Geological Survey (2005)

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The Mineral Industry of Alaska

In 2005, Alaska's nonfuel raw mineral production was valued[1] at $1.47 billion, based upon annual U.S. Geological Survey (USGS) data. This was a $200 million, or a 15.7% increase, from the State's total nonfuel mineral value for 2004, which was up $190 million, or up 17.6% from that of 2003. The State ranked 13th among the 50 States in total nonfuel mineral production value following three consecutive years as 12th and accounted for about 2.7% of the U.S. total value. Yet, per capita, the State ranked second in the Nation in the value of its mineral industry's nonfuel mineral production; with a population of 664,000, the value of production was about $2,220 per capita.

During 2005, metallic minerals accounted for nearly 96% of the total value of Alaska's nonfuel mineral production. Nearly all the metals value was the result of zinc, lead, gold, and silver production (in descending order of value) from Teck Cominco Alaska Inc.'s Red Dog Mine near Kotzebue in northwestern Alaska and the Greens Creek Mine (a joint venture of Kennecott Mineral Co. and Hecla Mining Co.) in southeastern Alaska southwest of Juneau and most of the gold production from Kinross Gold Corp.'s Fort Knox Mine near Fairbanks in east-central Alaska and from the Greens Creek Mine. Nearly all other gold production was from placer gold resources. Although the production levels of silver and zinc decreased somewhat from those of 2004, increases in the average unit values of each, especially in that of zinc, resulted in significant increases in the values of those mineral commodities. In the case of zinc, the rise in value and unit value was substantial, its total value rising by more than $190 million. Although production was down somewhat for gold and lead, their unit values rose, the largest increase being that of lead, up nearly 11%.

Although crushed stone production was only up slightly, the value of crushed stone was up nearly 10%, or about $1.4 million. An 8% decrease in construction sand and gravel production resulted in an about 7%, or a $3.5 million decrease, in its value (table 1).

In 2005, Alaska continued to rank first in the quantities of zinc and silver produced, second in lead, and was third of 11 gold-producing States (second in 2004). The State ranked first in the production of cadmium as a byproduct of zinc production. Production of peat in Alaska was not reported to the USGS partly because of reporting difficulties associated with the seasonal, intermittent nature of peat mining in the State. The Alaska Department of Natural Resources (ADNR), Division of Geological and Geophysical Surveys (DGGS), estimated peat production to be about 62,500 cubic meters, valued at about $810,000 (Hughes and Szumigala, 2006§[2]). The DGGS provided the following narrative information;[3] the data are based on DGGS surveys and estimates.

Exploration, Development, and Drilling Activities

Estimated exploration expenditures during 2005 were about $104 million, which was a substantial increase compared with expenditures of $71 million in 2004 (Hughes and Szumigala, 2006§). Although most of the effort was directed toward gold projects, some expenditure was noted for nickel-copper and platinum-group metals, diamond, and base metals. Exploration was conducted across Alaska, but primarily in southwestern Alaska. There were 16 exploration projects with budgets greater than $1 million. The Fairbanks mining district gold projects (Kinross Gold Corporation), the Pebble copper-gold project (Northern Dynasty Minerals Ltd.), and the Donlin Creek gold project near Crooked Creek on the Kuskokwim River accounted for most of the exploration expenditures and drill footage. Advanced exploration projects included the Donlin Creek gold project (Calista Corp., NovaGold Resources Inc., and Placer Dome Inc.) and the Pebble copper-gold project (Northern Dynasty Minerals Ltd.).

Base-metal exploration was led by NovaGold Resources Inc.'s exploration of the Arctic volcanogenic massive sulfide deposit in the Brooks Range. Platinum and associated metals exploration continued at the MAN project in the Alaska Range (Anglo American Exploration Ltd. and Nevada Star Resource Corp.) and at Union Bay in southeastern Alaska (Freegold Ventures Ltd., Lonmin Plc, and Pacific North West Capital Corp.).

Gold remained a major exploration target, but copper-gold porphyry systems (grouped with polymetallic deposits) were the major exploration target in 2005. Base-metal exploration expenditures decreased significantly from 2004 levels. Platinum-group-metal exploration was unchanged.

Investment in mine development increased to $348 million for 2005, which was a significant increase compared with the $209 million spent in 2004. The increase was primarily owing to significant advancements in the development of five mining projects.

Teck Pogo Inc. continued construction at the Pogo project after the company received its final permits and started construction in 2004. An all-weather, 80-kilometer (km) road was completed between Richardson Highway and the project site. In addition, construction of ground-level mining operations and associated facilities were nearly completed by yearend. Fairbanks Gold Mining Co., Inc., (a wholly owned subsidiary

[1]The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2005 USGS mineral production data published in this chapter are those available as of December 2006. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—can be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

[2]References that include a section mark (§) are found in the Internet References Cited section.

[3]Richard A. Hughes of the Alaska Department of Commerce, Community and Economic Development's Division of Community and Business Development, and David J. Szumigala, Senior Mineral Geologist with the Alaska Department of Natural Resources' Division of Geological and Geophysical Surveys, authored the text of the State mineral industry information provided by that State agency.

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of Kinross Gold) continued advanced stripping at the Fort Knox Mine. Coeur Alaska Inc. continued development investment at its Kensington project. However, construction efforts were suspended on the tailings facility, pending resolution of a nongovernment organization's lawsuit to prevent the disposal of tailings in a nearby alpine lake. The lawsuit was advanced to the Ninth District Court. Kennecott Greens Creek Mining Co. allocated expenditures for further development of its Greens Creek underground mine near Juneau.

Drilling was conducted on various projects across Alaska during 2005, covering all phases of mining, including exploration, development, and production. Drilling totals for 2005 were 181,000 meters (m) of core drilling, 12,700 m of reverse-circulation drilling, and 1,020 m of placer auger/churn drilling.

Extensive drilling programs were conducted in most areas of the State during the year. Northern Dynasty continued a very aggressive program at its Pebble property. Liberty Star Gold Corp. also began an extensive drilling project at the Big Chunk property near Pebble. Fairbanks Gold Mining Co., Inc. continued ore definition and exploration drilling at the Fort Knox Mine in the Fairbanks mining district. In southeastern Alaska, Kennecott Minerals Co. had the largest program, including exploratory drilling associated with further development of its Greens Creek Mine. Other drilling programs in southeastern Alaska were conducted by Coeur Alaska Inc. at the Kensington and Jualin properties, by Freegold Ventures Ltd./Pacific North West Capital Corp./Lonmin Plc at the Union Bay property, by Niblack Mining Corp. on the Niblack property, and by Quaterra Resources Inc. at the Duke Island property. In south central Alaska, major drilling programs were conducted by Kennecott Exploration Co. at the Whistler property, by Piper Capital Inc. on the Golden Zone property, and by Anglo American Exploration (USA) Inc. on the MAN property. AngloGold Ashanti (USA) Exploration Inc. drilled at several properties including the LMS and Terra projects. NovaGold Resources Inc. drilled at the Rock Creek, Big Hurrah, Khotol and Arctic properties in the northern and western regions. Teck Cominco Alaska Inc. drilled in the Red Dog area and on the Pogo property, and St. Andrew Goldfields Ltd./Mystery Creek Resources Inc. continued underground drilling at the Nixon Fork property.

Commodity Review

The production estimates included in this report were compiled from DGGS questionnaires and telephone interviews of Alaskan Native corporations, agencies, and municipalities (Hughes and Szumigala, 2006§). Production data were collected on metals (gold, lead, silver, and zinc), industrial minerals (rock and sand and gravel), and coal and peat. In 2005, total minerals industry employment was estimated to be 2,821 full-time-equivalent jobs compared with 3,048 in 2004 (Hughes and Szumigala, 2006§).

Industrial Minerals

Crushed Stone and Sand and Gravel.—Production of crushed rock decreased to 2.5 million metric tons (Mt) in 2005, down significantly from the 6.6 Mt produced in 2004. Sand and gravel production also declined in 2005, decreasing to 15.1 Mt from the 17.7 Mt produced in 2004. The data reflect some shortfall in reporting, but mainly reflect curtailments or reductions in production (Hughes and Szumigala, 2006§).

Metals

Gold.—Fairbanks Gold Mining Co., Inc. operated the Fort Knox Mine during 2005. However, its satellite True North Mine remained on care-and-maintenance status after having been closed indefinitely at yearend 2004. Approximately13.1 Mt of ore was mined and milled during the year, from which about 10,240 kilograms (kg) of gold was recovered. This was slightly less than the quantity recovered in 2004. Stripping volumes at Fort Knox totaled 57.4 Mt. The number of employees at the mine and mill averaged 411 during the year.

Reports of placer gold production were limited but reflected a decrease in production to 765 kg in 2005. The 2004 reported production was 873 kg (Hughes and Szumigala, 2006§).

Zinc, Lead, and Silver.—The Red Dog Mine was the world's leading producer of zinc. Red Dog is 100% owned by Teck Cominco Limited and is operated by its subsidiary (Teck Cominco Alaska Inc.) under an agreement with NANA Regional Corporation, Inc. (an Alaskan Native-owned corporation). The mine is located in the DeLong Mountains of Alaska's Brooks Range. This remote site is approximately 144 km north of Kotzebue and 88 km from the Chukchi Sea.

Red Dog dominated Alaska's mineral production value and accounted for more than 64% of the annual value of Alaska's mineral industry. The mill processed 3.09 Mt at an average grade of 21.7% zinc. Sulfide concentrates contained 568,000 metric tons (t) of zinc, and 102,000 t of lead; the mine was credited with about 61,300 kg of recovered silver. Red Dog reported an operating profit of $325 million compared with $207 million for 2004. The higher profits were attributed to an increase in average metal prices (Teck Cominco Limited, 2006§). According to Platts Metals Week published quotations, the North American price for Special High Grade zinc was about $1.48 per kilogram ($0.67 per pound) in 2005 compared with $1.17 per kilogram ($0.53 per pound) in 2004.

The Greens Creek Mine produced a silver-gold dore and sulfide concentrates that contained zinc and lead. In 2005, about 651,000 t of ore was milled, representing an 11% decrease compared with that of 2004 (Rio Tinto plc, 2006§). Metal production from the milled ore totaled 2,260 kg of gold, 16,500 t of lead, 302,000 kg of silver, and 52,900 t of zinc.

Government Programs, Activities, Reclamation Awards

The Alaska DGGS continued its active participation in the STATEMAP program, a component of the USGS National Cooperative Mapping Program, which is congressionally mandated by the National Cooperative Geologic Mapping Program (NCGMP). The USGS distributes Federal funds through NCGMP to support geologic mapping efforts utilizing a competitive funding process. The NCGMP has three primary components: (1) FEDMAP, which funds Federal geologic

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TABLE 9—Continued
WORLD AND U.S. PRODUCTION OF SELECTED NONFUEL MINERAL COMMODITIES[1]

(Thousand metric tons unless otherwise specified)

Mineral or product		World total					United States	
		2001	2002	2003	2004	2005	2005	Percentage of world total
Industrial minerals—Continued:								
Feldspar		11,800 r	12,000 r	12,200 r	12,600 r	12,900	748	5.8
Fluorspar	metric tons	4,600,000 r	4,430,000 r	4,910,000 r	5,220,000 r	5,260,000	--	--
Graphite, natural	do.	816,000 r	932,000 r	999,000 r	1,020,000 r	1,050,000	--	--
Gypsum		105,000	107,000 r	110,000 r	112,000 r	118,000	21,100	17.9
Iodine, crude	thousand kilograms	20,700	21,000	22,900 r	24,800 r	25,400	1,570	6.2
Lime		121,000	120,000 r	125,000 r	127,000 r	127,000	20,000 [7,8]	15.7
Magnesite, crude[5]		11,100	13,600	14,000	14,700 r	14,300	W	NA
Mica, including scrap and flake[9]	metric tons	368,000	269,000	271,000 r	319,000 r	294,000	78,100	26.6
Nitrogen, N content of ammonia		105,000	109,000	110,000	117,000	121,000	8,040 [10]	6.6
Peat		23,200 r	26,200 r	25,200 r	26,400 r	26,400	685	2.6
Perlite	metric tons	1,730,000	1,810,000 r	1,810,000 r	1,860,000 r	1,950,000	508,000 [7]	26.1
Phosphate rock[3]		126,000	135,000	138,000 r	141,000	147,000	36,100	24.5
Potash, K_2O equivalent		26,400	26,800 r	28,400	30,400 r	31,100	1,200	3.9
Pumice		15,600 r	16,200 r	16,600 r	17,700 r	17,500	1,270 [7]	7.2
Salt		214,000 r	212,000 r	218,000 r	229,000 r	238,000	45,200 [8]	19.0
Sand and gravel, industrial, silica		113,000 r	113,000	115,000 r	117,000 r	118,000	30,600 [7]	25.9
Soda ash, natural and manufactured		35,700 r	37,200 r	38,400 r	40,300 r	41,900	11,000 [11]	26.2
Sulfur, all forms		61,400 r	62,600 r	64,200 r	66,000 r	66,000	9,460	14.3
Talc and pyrophyllite[12]	metric tons	8,780,000 r	7,590,000 r	8,100,000 r	8,230,000 r	8,250,000	856,000	10.4
Titanium concentrates:[3]								
Ilmenite and leucoxene	do.	5,130,000 r	5,470,000 r	5,720,000 r	5,640,000	5,840,000	500,000 [13]	8.6
Rutile[5]	do.	421,000	446,000	361,000	354,000 r	369,000	(14)	NA
Vermiculite	do.	431,000	497,000 r	491,000	516,000 r	527,000	100,000	19.0

rRevised. NA Not available. W Withheld to avoid disclosing company proprietary data; not included in "World" total. -- Zero.
[1]Data are rounded to no more than three significant digits.
[2]Primary.
[3]Gross weight.
[4]Individual country figures that are included in the world total represent dried bauxite equivalent of crude ore, but for some countries available data are insufficient to permit this adjustment.
[5]"World total" for years listed does not include U.S. production.
[6]Includes tin content of alloys made directly from ore.
[7]Quantity sold or used by producers.
[8]Includes Puerto Rico.
[9]Excludes, if any, U.S. production of low-quality sericite and sheet mica.
[10]Synthetic anhydrous ammonia; excludes coke oven byproduct ammonia.
[11]U.S. production is natural only.
[12]Data for the United States exclude proprietary pyrophyllite production.
[13]Includes rutile to avoid disclosing company proprietary data. Rounded to one significant digit.
[14]Included with ilmenite to avoid disclosing company proprietary data; not included in "Total."

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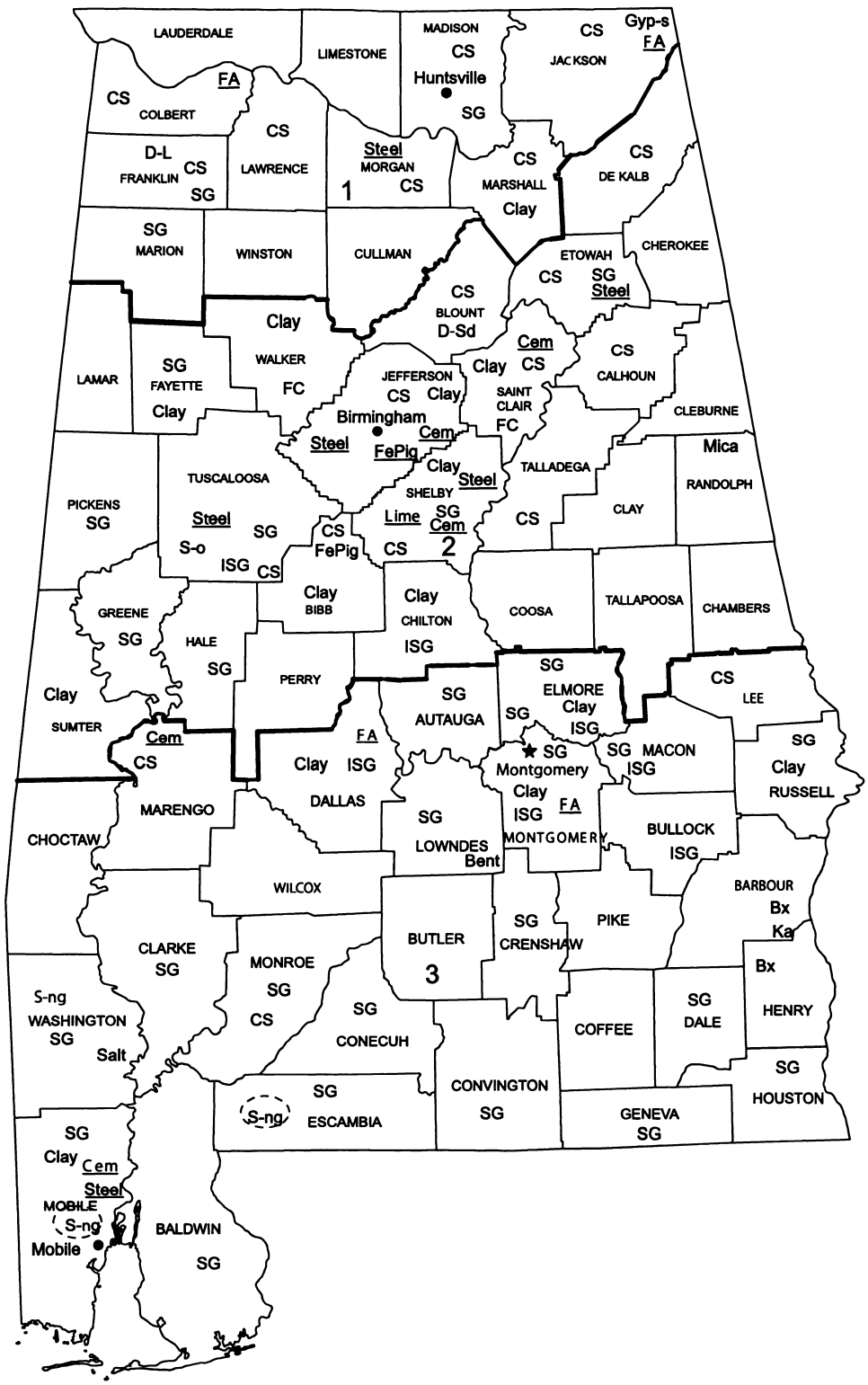
ALABAMA



LEGEND

- County boundary
- ★ Capital
- ● City
- 1 Crushed stone/sand and gravel districts

MINERAL SYMBOLS
(Major producing areas)

Bent	Bentonite
Bx	Bauxite
Clay	Common clay
Cem	Cement plant
CS	Crushed stone
D-L	Dimension limestone
D-Sd	Dimension sandstone
FA	Ferroalloys plant
FC	Fire clay
FePig	Iron oxide pigments
FePig	Iron oxide pigment plant
Gyp-s	Synthethic gypsum
ISG	Industrial sand and gravel
Ka	Kaolin
Lime	Lime plant
Mica	Mica
S-ng	Sulfur (natural gas)
S-o	Sulfur (oil)
Salt	Salt
SG	Construction sand and gravel
Steel	Steel plant
	Concentration of mineral operations

0 50 Kilometers

Source: Geological Survey of Alabama/U.S. Geological Survey (2005)

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THE MINERAL INDUSTRY OF ALABAMA

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Geological Survey of Alabama for collecting information on all nonfuel minerals.

In 2005, Alabama's nonfuel mineral production was valued[1] at $1.12 billion, based upon annual U.S. Geological Survey (USGS) data. This was a 16.1% increase compared with that of 2004 following a 7.2% increase from 2003 to 2004. The State ranked 20th among the 50 States in total nonfuel mineral production value and accounted for more than 2% of the U.S. total.

The top four nonfuel mineral commodities produced in Alabama in 2005 continued to be, in descending order of value, cement (portland and masonry), crushed stone, lime, and construction sand and gravel. These four commodities accounted for 94% of the State's total nonfuel mineral production value; the combined value of cement and crushed stone represented nearly 72% of the total.

Most of Alabama's nonfuel minerals increased in production value in 2005. Leading in the State's rise in value were increases in the values of cement overall (portland and masonry), crushed stone, and lime (while the quantity produced decreased), up about $106 million, $29 million, and $17 million, respectively (table 1).

Nonfuel mineral production in Alabama consisted entirely of industrial minerals. Alabama continued to be third in the quantities of lime it produced, third of four iron oxide pigment-producing States, and fourth in bentonite, seventh in portland cement, and eighth in salt. The State rose to 2d in rank in mica production with the opening of a new operation, to 2d from 3d in common clays, to 4th from 5th in masonry cement, and to 9th from 10th in gemstones (based upon value), while it decreased to third from second in kaolin. Additionally, Alabama was the producer of substantial quantities of, in descending order of value, crushed stone, construction sand and gravel, and industrial sand and gravel. All metal production in the State, especially that of raw steel, was the result of processing materials acquired from other domestic and foreign sources. Production of a natural mixture of bauxite (no longer used to produce primary aluminum) and bauxitic clay with very low iron oxide content has been reported to the USGS since 1995 as kaolin; it is primarily used to make refractory products.

The narrative information that follows was provided by the Geological Survey of Alabama[2] (GSA).

Exploration and Development

Mineral exploration in Alabama continued to focus on industrial mineral resources with several large expansions of operations happening in the State (including crushed stone, cement, brick/tile, lime, and calcium carbonate).

Commodity Review

Industrial Minerals

In 2005, 166 companies or operations were involved in the mining and production of industrial mineral resources in Alabama. This included 50 limestone-dolomite operations for crushed stone that were active in the State. In addition, granite, marble, quartzite, and sandstone, operations for crushed stone were active in the State. New granite crushed stone quarries were operating in Lee and Randolph Counties.

The GSA reported another year of record crushed stone production for Alabama with more than 49.5 million metric tons (Mt) produced in the State. Birmingham-based Vulcan Materials Co. remained the leading construction aggregate producer in the country. Marble operations were active for the production of micronized calcium carbonate and building stone. Alabama had 20 active clay (bentonite, common clay, fire clay, fuller's earth, kaolin, and shale) operations. Clay production was lead by common clay followed by shale, fuller's earth, bentonite, fireclay, and kaolin.

Alabama had 76 active sand and gravel operations. Sand and gravel production came primarily from alluvium and terrace deposits in Elmore, Macon, Montgomery, Russell, and Tuscaloosa Counties and from the Citronelle Formation in Mobile County.

Other industrial mineral operations included bauxitic clays, building stone (limestone and sandstone), chalk, recovered sulfur, salt (solution recovery), and silicon.

A mica recovery operation that began production in 2004 continued operations at Micaville, Randolph County. Muscovite flake mica occurs as finely disseminated flakes in the mica schist of the northern Alabama Piedmont. Scrap or flake mica is used by industry in dry-, wet-, or micronized-ground form.

Government Activities and Programs

The largest beach renourishment project along coastal Alabama was continued in 2005 by the City of Gulf Shores which initiated a $25 million project in 2003 to pump sand from the bottom of Little Lagoon to the Gulf of Mexico shoreline along nearby West Beach. An estimated 15% to 30% of the sand that was added was displaced by Hurricane Katrina (Dezember, 2005).

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[1]The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2005 USGS mineral production data published in this chapter are those available as of December 2006. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—can be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

[2]Lewis S. Dean, a Geologist in the Economic Geology Division at the Geological Survey of Alabama, authored the text of the State mineral industry information provided by that agency.

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The Alabama Department of Transportation (ADOT) has an annual maintenance and construction program for nearly 18,000 kilometers of highway. This work represents one of the largest uses of asphaltic and bituminous base, concrete, and stone and gravel aggregate in the State. A revised listing of approved sources of coarse and fine aggregates is available from the ADOT (Alabama Department of Transportation, 2006§[3]).

In 2005, the GSA continued to publish 1:24,000-scale geologic maps in Alabama in conjunction with the STATEMAP program. STATEMAP is a component of the Congressionally mandated USGS National Cooperative Geological Mapping Program (NCGMP), which the USGS distributes Federal funds to support geologic mapping efforts through a competitive funding process. The NCGMP has three primary components: (1) FEDMAP, which funds Federal geologic mapping projects, (2) STATEMAP, which is a matching-funds grant program with State geological surveys, and (3) EDMAP, a matching-funds grant program with universities that has a goal to train the next generation of geologic mappers. This new geologic map information is being used in a variety of ways in these rapidly urbanizing parts of the State. For example, geologic mapping aids in the identification of supplies of industrial mineral resources (sand, gravel, and crushed stone) that support construction and infrastructure development. Published geologic 7.5-minute quadrangles during 2005 included the Greenbrier and Mason Ridge quads in the Limestone and the Madison County areas of the Tennessee Valley and the Vincent and Talladega quads in the Shelby, the St. Clair, and the Talladega County areas of the Valley and Ridge geologic province.

More information on geology, hydrology, mineral occurrence, mining history, and general economics of specific mineral resources in Alabama is available from the Geological Survey of Alabama. Much of this information, as well as contact information, are available over the Internet at http://www.gsa.state.al.us.

[3]A reference that includes a section mark (§) is found in the Internet Reference Cited section.

Reference Cited

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TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN ALABAMA[1,2]

(Thousand metric tons and thousand dollars)

Mineral	2003		2004		2005	
	Quantity	Value	Quantity	Value	Quantity	Value
Cement:						
Masonry	565	55,700 e	430	49,400 e	475	54,800 e
Portland	4,330	273,000 e	4,800	320,000 e	5,120	421,000 e
Clays:						
Bentonite	125	3,810	100	3,050	109	3,480
Common	1,920	24,000	2,120	29,600	2,280	29,000
Gemstones	NA	356	NA	356	NA	371
Lime	2,290	151,000	2,280	164,000	2,240	181,000
Sand and gravel:						
Construction	14,500	67,600	14,700	65,300	15,700	70,500
Industrial	723	9,180	643	9,800	710	11,200
Stone, crushed	49,300	286,000	47,800 r	296,000 r	49,500	325,000
Combined values of clays (kaolin), iron oxide pigments (crude), mica [crude (2004)], salt, stone (dimension marble and sandstone)	XX	30,000	XX	27,000	XX	27,000
Total	XX	900,000	XX	965,000 r	XX	1,120,000

eEstimated. rRevised. NA Not available. XX Not applicable.

[1]Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

[2]Data are rounded to no more than three significant digits; may not add to totals shown.

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mapping projects, (2) STATEMAP, which is a matching-funds grant program with State geological surveys, and (3) EDMAP, a matching-funds grant program with universities that has a goal to train the next generation of geologic mappers.

By yearend 2005, in excess of 2.46 million hectares (ha) (6.1 million acres - more than 9,500 square miles) of Alaska was flown over for detailed geophysical surveys. About 1.1 million ha (2.7 million acres) of 1:63,360-scale geologic maps were produced. These surveys were conducted as part of the State-funded Alaska Airborne Geophysical/Geological Mineral Inventory (AGGMI) Program. Federal monies through the STATEMAP Program funded some of the geologic mapping within the AGGMI Program.

During the year, geologists from the Mineral Resources Section of the DGGS mapped and sampled 33,929 ha (131 square miles) around the historic Liberty Bell Mine near Healy. Geochemical data from this work was released in November. A 1:50,000–scale geologic map was expected to be available in late 2006.

DGGS also released a series of new 1:50,000-scale surficial and bedrock geologic maps of the Council and Big Hurrah areas of the southern Seward Peninsula as part of an integrated program following up the airborne geophysical survey results previously released by DGGS in 2003 and fieldwork conducted in 2004.

In addition, DGGS released new trace-element geochemical data from reanalyses of archived stream-sediment pulps originally collected in 1982 near the town of Livengood. Of the 1,597 stream-sediment samples originally collected in 1982, DGGS recovered 952 samples for reanalyses. Revenue for these new geochemical analyses was provided by AngloGold Ashanti North America Inc. These data complemented data collected over 33,670 ha (130 square miles) of the central Livengood Quadrangle in 2001 and 2003 by DGGS.

In early 2005, DGGS released a 54,390-ha (210-square-mile) airborne magnetic and electromagnetic geophysical survey in the southern Goodpaster region of the Big Delta Quadrangle. DGGS also funded and acquired airborne magnetic and electromagnetic geophysical surveys for 244,495 ha (944 square miles) of highly prospective areas for mineral deposits in the Circle, Fairbanks, Goodpaster, and Richardson mining districts. The survey maps and data for these surveys were to be released in 2006. In addition, induced electromagnetic conductivity and total magnetic field geophysical surveys were flown over 375,548 ha (1,450 square miles) of mineral-rich lands in the southern National Petroleum Reserve-Alaska (NPR-A). These surveys were funded by the U.S. Bureau of Land Management (BLM) and were to be released by DGGS in early 2006. The NPR-A surveys included 9,656 line-kilometers (6,000 line miles) flown at a 400-meter (quarter-mile) spacing with sensors 61 meters (200 feet) above the ground. The area around the Drenchwater Creek Sedex-type lead-zinc-silver deposit was flown at a 200-meter (one-eighth mile) line spacing. Data from the NPR-A surveys, plus all historic DGGS publications, and most USGS publications concerning Alaska's geology and resources are available for download at no charge at the DGGS Web site (http://www.dggs.dnr.state.ak.us).

The State of Alaska, through DGGS, funded an airborne geophysical survey for the Alaska Highway corridor from slightly west of Delta Junction to slightly east of the Alaska-Yukon border. The survey was acquired and processed by Fugro Airborne Surveys and managed by Stevens Exploration Management Corp. Aeromagnetic and electromagnetic data were obtained for 788,651 ha (3,045 square miles), over a 25.7-km (16-mile) wide swath centered on the Alaska Highway. The survey was to be released in early 2006. Preliminary surficial and bedrock geologic mapping studies were planned for the 2006 survey program.

The BLM Sustainable Mineral Development Reclamation Award in the small operator category was presented to a placer miner prospecting on Gold Creek along the Dalton Highway. The award recognized his conscientious and timely reclamation efforts toward maintaining a stable channel and flood plain. The awardee replicated the original stream channel by matching its grade and channel width to adjacent undisturbed areas. Two other miners, as well as the American Reclamation Group LLC, received annual State Reclamation Awards from the Alaska Department of Natural Resources (DNR). The awards were presented in recognition of their respective placer mining reclamation efforts in the Squaw Creek, Fairbanks, and Kaiyuh mining districts. Specifically, the American Reclamation Group successfully heap-leached the remaining ore and then reclaimed the heap leach and mine site area to closure standards at the bankrupt Illinois Creek gold-silver mine. The reclamation efforts were conducted without use of State funds, although the mine was acquired by the State as a result of the bankruptcy.

In 2005, an area plan and environmental impact statement (EIS) process were begun by the BLM for approximately 3.7 million ha (9.2 million acres) of land in the southern NPR-A. The BLM also issued an amended integrated activity plan and an EIS for the northeast NPR-A, and a draft EIS was released for the 2.9 million ha (7.1 million acres) of BLM-managed land in the East Alaska Resource Management Plan (RMP). In addition, a draft RMP/EIS was issued for the Ring of Fire lands in the southeastern and south central regions of the Alaska Peninsula, and the Aleutian Islands managed by the BLM. Also, a decision record was issued by the BLM to amend all RMP, NPR-A and management framework integrated activity plans for all BLM-managed lands in Alaska, so as to update the direction for wildland fire and fuels management.

The USGS, in cooperation with other agencies, continued a 5-year project titled "Tintina Metallogenic Province Integrated Studies on Geological Framework, Mineral Resources, and Environmental Signatures," as well as a project titled "Regional Geologic and Mineral Deposit Data for Alaskan Economic Development." The economic development project focused on the Seward Peninsula and the central part of southwestern Alaska. Stream-sediment, heavy-mineral concentrate, and stream-water samples were collected by the USGS from more than 400 locations in the Taylor Mountains Quadrangle. Gold was observed in 85 of the 427 panned-concentrate samples collected in 2005. The project also included reconnaissance geologic mapping and ground magnetic traverses. Studies also were continued by the USGS on the base-metal resource potential of the Nome Group on the Seward Peninsula.

BLM geologists visited 184 mineral localities and collected 645 samples as part of their continuing mineral investigation in the Aniak Mining District, southwestern Alaska. The Aniak

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studies were carried out in cooperation with the USGS, DGGS, Geological society of America, and the Calista Native Corp. The BLM also initiated mineral investigations in the Taylor Mountains Quadrangle in cooperation with ongoing USGS studies.

Cooperative projects also were conducted by the USGS, DGGS, and BLM under the Minerals Data and Information Rescue in Alaska (MDIRA) program. DGGS-managed, MDIRA-funded projects included compilation of an Alaska bedrock and surficial geology map index, a DGGS lithochemical data file, and an Alaska geochonological data file, as well as the creation of a comprehensive DGGS database system. DGGS continued working on a project to make all USGS Bulletins and Professional Papers pertaining to Alaska viewable and retrievable online through the DGGS Web site. DGGS continued a similar project that includes Alaska-related USGS Open-File Reports, Field Studies, Geologic Quadrangle Maps, Mineral Resources Maps, and various other short-series USGS publications. Other MDIRA-funded projects were in progress during the year at other divisions of DNR, at the University of Alaska Fairbanks, and with private contractors.

The State of Alaska continued efforts to finalize land transfers from BLM's Federal Government ownership (BLM) to other ownership, including Alaska Native allottees, Alaska Native corporations, the State of Alaska, municipalities, the Alaska Mental Health Land trust, and the University of Alaska. The State was working toward accelerating the remaining land transfers by 2009, the 50th anniversary of Alaska statehood and the deadline imposed for the land transfers by Federal Senate bill 1466. The State had about 5.87 million ha (14.5 million acres) of grant entitlement land, and 13.8 million ha (34 million acres) of selected lands remaining at yearend. DNR agencies have identified about 8.1 million ha (20 million acres) of these lands as having moderate-high to high potential for minerals, oil and gas, surface resources, or access corridors. About 2.4 million ha (6 million acres) is dual selected by both State agencies and Native corporations, thus introducing some uncertainty as to final ownership for these lands upon completion of the transfer process. During the year, the DGGS reviewed the 1990s priorities for the selected lands and reprioritized these lands based upon new geologic information, new mineral deposit models, and other information. The reprioritization process was multiphase and iterative. DGGS reviewed existing geologic and mineral deposit information using MapInfo GIS software, including geologic maps, geophysical data, locations of 7,000 mineral occurrence sites categorized by mineral deposit model (Alaska Resource Deposit Files; http://ardf.wr.usgs.gov/) geochemical samples (e.g., DGGS web geochemistry, http://www.dggs.dnr.state.ak.us/webgeochem/index.jsp), State and Native selected lands, and current Federal and State mining claims, as well as results from DGGS probabilistic modeling created for the 1992 mineral endowment estimation for selected areas. In late September, a final State Ownership Priority List was completed for 7.3 million ha (18 million acres) of Alaska lands having moderate to high potential for mineral and energy resources. Future work was expected to include prioritizing remaining State land selections as needed to complete State land entitlement.

The U.S. Army Corps of Engineers released the draft EIS and draft Feasibility Report for improvements to the DeLong Mountain Transportation System (DMTS), and the Red Dog Mine port, and associated facilities. Included in the report was a proposal to build a longer loading trestle that would extend about 500 m (1,600 feet) into the Bering Sea, dredging a turning basin on the north side of the trestle, and dredging a slot from the turning basin that would extend about 6.4 km (4 miles) into deeper water in the Bering Sea. The proposed changes would allow for direct loading and unloading of large oceangoing ships rather than the current method of using intermediate barges. It also was anticipated that the Red Dog Mine and area villages would benefit from the proposed changes through reductions in transportation costs for fuel and supplies.

The Alaska Department of Transportation & Public Facilities continued construction of several roads along State-controlled property that would provide access to the Kensington gold project near Juneau. A 4-km (2.5-mile) road costing nearly $1 million was completed from the current northend of the Juneau road system to a ferry terminal at Cascade Point. In addition, the bidding process was begun for construction of a 7.9 km (4.9-mile) road that would permit access from Slate Creek Cove to the Kensington mill site on the west side of Berners Bay. The road construction, expected to cost $1.1 million, was to be funded under the State's industrial roads program.

More than 1.9 million ha (4.6 million acres) of Alaska was covered in wildfires during 2005, following the record-breaking 2.6 million ha (6.4 million acres) burned in 2004. Mining and construction projects were adversely affected by the fires and the smoke that obscured large portions of the State throughout much of the summer.

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TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN ALASKA[1, 2]

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral	2003		2004		2005	
	Quantity	Value	Quantity	Value	Quantity	Value
Gemstones	NA	12	NA	12	NA	12
Sand and gravel, construction	9,980	55,700	9,430	51,600	8,660	48,100
Stone, crushed	2,640 [3]	15,300 [3]	2,270 [r]	14,200 [r]	2,360	15,600
Combined values of cadmium (byproduct of zinc concentrates, [2004-05]), gold, lead, silver, stone (crushed granite and shell, [2003]), zinc	XX	1,010,000	XX	1,200,000 [r]	XX	1,410,000
Total	XX	1,080,000	XX	1,270,000 [r]	XX	1,470,000

[r]Revised. NA Not available. XX Not applicable.
[1]Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2]Data are rounded to no more than three significant digits; may not add to totals shown.
[3]Excludes certain stones; kind and value included with "Combined values" data.

TABLE 2
ALASKA: CRUSHED STONE SOLD OR USED, BY KIND[1, 2]

Kind	2004			2005		
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Number of quarries	Quantity (thousand metric tons)	Value (thousands)
Granite	1 [r]	W	W	3	120	$1,100
Traprock	3	468	$3,550	2	102	906
Shell	1	W	W	1	W	W
Miscellaneous stone	7	1,760	10,300	9	2,140	13,600
Total	XX	2,270 [r]	14,200 [r]	XX	2,360	15,600

[r]Revised. W Withheld to avoid disclosing company proprietary data. XX Not applicable.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Data derived, in part, from information obtained from the Alaska Department of Natural Resources, Division of Geological and Geophysical Surveys.

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TABLE 3
ALASKA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2005, BY USE[1, 2]

(Thousand metric tons and thousand dollars)

Use	Quantity	Value
Construction:		
Coarse aggregate (+1½ inch):		
Riprap and jetty stone	W	W
Filter stone	W	W
Total	28	366
Coarse aggregate, graded:		
Bituminous aggregate, coarse	W	W
Other graded coarse aggregates	W	W
Total	78	824
Fine aggregate (-⅜ inch):		
Stone sand, bituminous mix or seal	W	W
Other fine aggregates	W	W
Total	162	1,630
Coarse and fine aggregates:		
Graded road base or subbase	86	757
Unpaved road surfacing	W	W
Crusher run or fill or waste	W	W
Other coarse and fine aggregates	59	500
Total	288	2,500
Unspecified, reported[3]	1,810	10,300
Grand total	2,360	15,600

W Withheld to avoid disclosing company proprietary data; included in "Total."
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Data derived, in part, from information obtained from the Alaska Department of Natural Resources, Division of Geological and Geophysical Surveys.
[3]Reported and estimated production without a breakdown by end use.

TABLE 4
ALASKA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2005, BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate and concrete products	1,510	$9,960	$6.58
Asphaltic concrete aggregates and other bituminous mixtures	749	8,480	11.32
Road base and coverings	1,460	9,130	6.27
Fill	2,730	10,700	3.91
Snow and ice control	61	404	6.64
Other miscellaneous uses[2]	46	423	9.26
Unspecified:[3]			
Reported	918	3,340	3.64
Estimated	1,190	5,710	4.81
Total or average	8,660	48,100	5.56

[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.
[2]Includes railroad ballast and filtration.
[3]Reported and estimated production without a breakdown by end use.

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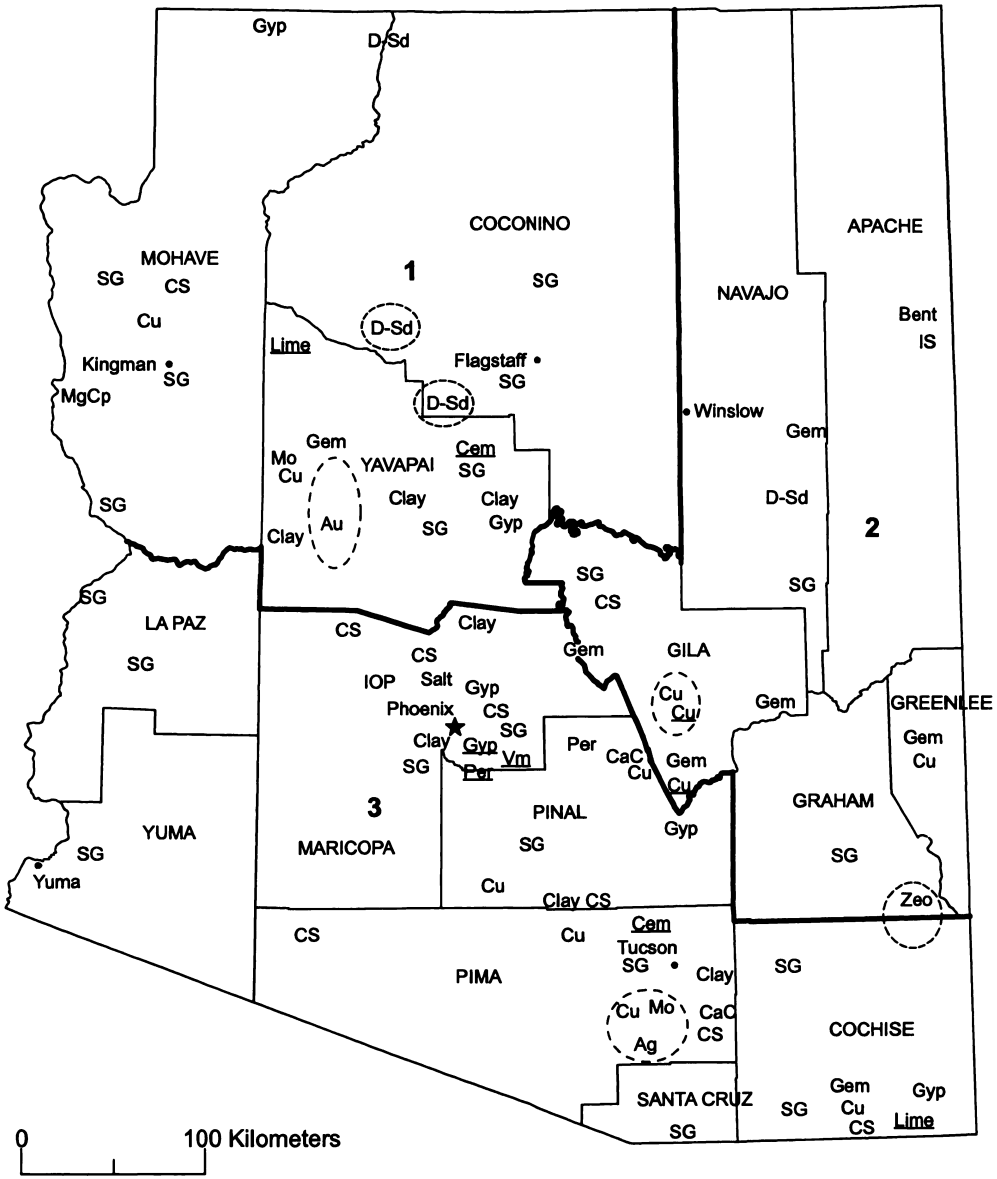
ARIZONA



LEGEND

- County boundary
- Capital
- City
- 1 — Crushed stone/sand and gravel districts

MINERAL SYMBOLS
(Major producing areas)

Ag	Silver
Au	Gold
Bent	Bentonite
CaC	Calcium carbonate
Cem	Cement plant
Clay	Common clay
CS	Crushed stone
Cu	Copper
Cu	Copper plant
D-Sd	Dimension sandstone
Gem	Gemstones
Gyp	Gypsum
Gyp	Gypsum plant
IOP	Iron Oxide Pigments
IS	Industrial sand
Lime	Lime plant
MgCp	Magnesium Compounds
Mo	Molybdenum
Per	Perlite
Per	Perlite plant
Salt	Salt
SG	Construction sand and gravel
Vm	Vermiculite plant
Zeo	Zeolites
(dashed)	Concentration of mineral operations

Source: Arizona Department of Mines and Mineral Resources/U.S. Geological Survey (2005)

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THE MINERAL INDUSTRY OF ARIZONA

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Arizona Department of Mines and Mineral Resources for collecting information on all nonfuel minerals.

In 2005, Arizona's nonfuel raw mineral production was valued[1] at $4.35 billion, based upon annual U.S. Geological Survey (USGS) data. This was a $1 billion, or nearly 30% increase from the State's total nonfuel mineral value in 2004, which then had climbed $1.17 billion, accounting for a 53.7% increase from 2003 to 2004. Arizona led the Nation in total nonfuel mineral production value, rising from third in rank in 2004 among the 50 States, accounting for nearly 7.9% of the U.S. total.

Arizona continued to be the Nation's leading copper-producing State in 2005 and accounted for nearly 61% of total U.S. copper mine production and value. Copper was the State's foremost nonfuel mineral produced, accounting for nearly 61% of Arizona's total nonfuel mineral production value, followed in descending order of value by molybdenum concentrates, construction sand and gravel (with nearly 12% of the State's total value), cement (portland and masonry), crushed stone (more than 1.5% of the value), and lime (table 1).

Arizona's substantial increase primarily resulted from the increased values of copper, molybdenum concentrates, and construction sand and gravel. Although small decreases in production took place for the first two mineral commodities, their values rose by $506 million and significantly more than $300 million, respectively. With a slightly less than 7% increase in construction sand and gravel production, its value increased by $86 million, or by 20%. Smaller yet substantial increases also took place in cement and lime. With a significant increase in unit value, the total value of cement rose by about 12%, while a 65% increase in lime production resulted in the commodity's value increasing almost as much, up by about 62%. The largest decrease in value was in that of crushed stone, down by $6.6 million, although its unit value rose by more than 7%. Lesser, although significant decreases, also took place in the production and values of dimension sandstone and salt (table 1).

The prices for copper and of molybdenum concentrates markedly rose during the past 2 years, but the trend toward the substantial rise in molybdenum concentrate prices began in December 2002 and continued on through 2003 and 2005. For example, as reported in Platts Metals Week (in dollars per pound of contained molybdenum) the annual average price of molybdic oxide rose from $8.27 per kilogram (kg) in 2002 to $11.75 per kg in 2003 to $36.76 per kg in 2004 and nearly doubled to $70.10 per kg in 2005. Molybdic oxide reached its alltime high of $80.75 per kg in May 2005 and then followed a generally downward trend for the rest of the year to close at $58.60 per kg in December 2005. The Platts Metals Week average producer price for copper rose from $0.76 per pound in 2002 to $1.73 per pound in 2005.

In 2005, Arizona continued to lead the Nation in the quantity of copper produced and remained second in gemstones (based on value), third in the production of crude perlite, fourth in zeolites, sixth overall in dimension stone (dimension sandstone), and seventh in silver. The State rose in rank in three nonfuel mineral commodities: to 1st from 2d in pumice and pumicite, 2d from 3rd in construction sand and gravel, and to 10th from 12th in the production of lime. Arizona decreased to third from first in molybdenum concentrates and continued to be a significant producer of, in descending order of value, portland cement, crushed stone, and masonry cement.

The Arizona Department of Mines and Mineral Resources[2] (ADMMR) provided the following narrative information. Data presented in ADMMR reports may differ somewhat from data reported by the USGS in table 1.

Commodity Review

Industrial Minerals

International aggregate producer Lafarge North America Inc. entered the Phoenix metropolitan sand and gravel market by acquiring Sun State Rock and Materials Corporation in the southwest valley, an area with great future growth potential. Lafarge North America Inc. has an interest in additional sites for exploration and purchase. Vulcan Materials Co. continued its expansion in Arizona by acquiring New West Materials Co. LLC, whose assets included three aggregate and asphalt facilities in the Phoenix area and two aggregate and asphalt facilities in Tucson. The Tucson operations were Vulcan's first in that market.

Metals

Copper and Molybdenum.—The rise in copper and molybdenum prices contributed significantly to the dramatic rise in the value of the State's mineral production. Shortages of mining truck tires, pit flooding, and labor strikes resulted in a 4.4% decline in copper production for 2005 despite the rise in copper prices and byproduct credits.

Five Phelps Dodge Corp. mines accounted for 78% of Arizona's copper production and helped the company post a record annual net income of more than $1.6 billion for 2005. The Morenci Mine was the leading copper-producing complex in the United States. In 2005, the mine produced 363,000

[1]The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2005 USGS mineral production data published in this chapter are those available as of December 2006. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—can be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

[2]Nyal J. Niemuth, Mining Engineer, authored the text of the State mineral industry information provided by the Arizona Department of Mines and Mineral Resources.

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metric tons (t) (800 million pounds) of copper via the solvent extraction-electrowinning (SX-EW) concentration and refining process. This represented more than 52% of Arizona's total production. In June, Phelps Dodge's board approved spending $210 million at Morenci to construct the first commercial scale concentrate-leach-direct-electrowinning facility and to restart the flotation mill. The concentrator was expected to resume production during 2006 using chalcopyrite ore from the Western Copper, Garfield, and other mine areas and produce 29,000 t of copper in concentrate. When completed, the pressure leaching plant is expected to use medium-temperature technology (160° C) to produce 68,000 metric tons per year (t/yr) of electrowinning copper. It was tested successfully for 7 months at the demonstration pressure leach plant at the Bagdad Mine. That plant reverted to the high temperature (225° C) process so that the Bagdad Mine could take advantage of the greater amount of acid generated by the high-temperature process for its oxide leaching operations. The technology used is proprietary and is shared under a development agreement between Placer Dome Inc. (acquired by Barrick Gold Corp.) and Phelps Dodge Corp.

Phelps Dodge's byproduct molybdenum production totaled 13,600 t largely from the Sierrita and Bagdad Mines. Molybdenum prices reversed roles with copper and made Sierrita the top revenue producer, out performing Phelps Dodge Corporation's Morenci Mine in earnings for part of the year. The electrolytic refinery at the Miami Mine was permanently closed in 2005. Smelting continued there along with residual leaching operations. The Safford project received tentative board approval of a $550 million expenditure to build two new open pits, Dos Pobres and San Juan, and a heap-leach SX-EW facility. Final approval was contingent on the project receiving State operating permits. Leach production was anticipated to begin in late 2008 at an annual rate of 109,000 t/yr. The deposits are about 488 million metric tons (Mt) and contain an average grade of 0.37% copper. Plans were to construct a plant to produce acid from elemental sulfur in the Safford area. The development is expected to have a positive impact on the local economy. The project was expected to generate 1,000 construction and 500 permanent jobs. A major drilling program, about 180,000 meters (m), was getting underway at year's end on two deposits located within 6.4 kilometers (km) (4 miles) of Dos Pobres Mine.

Safford was also the home of Phelps Dodge's Process Technology Center. In addition to its hydrometallurgical research capabilities, it will provide a high quality and cost effective central analytical facility, replacing labs located at its Arizona and New Mexico mines. Phelps Dodge's Tohono Mine restarted operation in the fourth quarter of 2004 to recover copper from existing leach piles. Cathode production totaled 2,300 t for 2005. Mineralized material reported for the Tohono deposit includes 250 Mt milling material grading 0.70% and 366 Mt leachable material grading 0.63%.

Asarco Inc. moved its headquarters to Tucson from Phoenix in April and announced it had become a limited liability corporation. The company is Arizona's second leading producer and struggled through a very difficult year. During the first half of the year things proceeded relatively well, as production from Ray, Mission, and Silver Bell Mines totaled 48,000 t, an increase of 25% compared with production in 2004. This increase took place despite the Ray Mine suffering from flooding caused by heavy winter rains and the Hayden smelter being closed for maintenance for 50 days. In July the union workforce went on a strike that lasted 16 weeks. Production declined to roughly one-half of capacity.

On August 9, Asarco LLC, filed for Chapter 11 of the Federal Bankruptcy in Federal Court in Texas. The resulting deconsolidation provided a debt reduction of $443 million for Asarco's owner Grupo Mexico. The strike ended in November after limited replacement worker hiring forced the company to abandon the concessions it had been seeking. Production from the three mines for the year totaled 141,000 t of copper, a decline of 9.5% largely owing to lost production during the strike.

Resolution Copper Co. plans to spend $250 million during the current phase of exploration and development on their giant Resolution Copper project located near Superior in Pinal County. Surface drilling resumed in February 2005. The company planned to increase exploration drilling following the development of two shafts. Deepening of the number 9 and sinking the number 10 shaft was scheduled to begin during 2006.

Mercator Minerals Ltd. made significant strides in increasing both copper production and resources at Mineral Park. Additions to the SX-EW plant allowed it to double production and achieve a capacity of 5,000 t/yr. Reserves for the property are 70 Mt grading 0.23% copper, while measured resources total 313 Mt at a copper equivalent grade of 0.41% using copper at $1.00 per pound and molybdenum at $7.00 per pound. Mercator Minerals Ltd. replaced its mining contractor by acquiring its own truck and shovel fleet. To accommodate future production increases, the company purchased an 18,000 metric-ton-per-day mill from Asarco LLC. If a future feasibility study was positive, the mine could resume producing copper and molybdenum concentrates for the first time in 25 years.

After a joint venture with BHP-Billiton failed to develop, Cambior Inc. decided to put the Carlota oxide copper property, along with equipment it had acquired up for auction. The equipment included 10 used 172-metric-ton trucks, 1 used P&H 2800 shovel and a SX-EW plant. The winning bid was $37.5 million in cash and gold by Quadra Mining Ltd. Quadra Mining Ltd. planned to begin construction in mid-2006 and expected production to begin in 2007. The Carlota project anticipated an 11-year life with an average production of 30,000 t/yr of copper cathode (Niemuth, 2006§)[3].

Augusta Resource Corp. entered into an agreement to acquire the Rosemont Mine copper deposit located south of Tucson in the Santa Rita Mountains. The purchase price was $20.8 million to be paid during 3 years. Previous drilling by Anaconda Copper Mining Co., AMAX Inc., and Asarco, LLC had identified 360 Mt of copper/molybdenum skarn-related mineralization in four deposits that contain approximately 2 Mt of copper. A 9,000-m drill program to produce a resource estimate has been completed.

General Minerals Corp. advanced three copper exploration targets. It acquired the legal rights allowing Teck Cominco Ltd.

[3]A reference that includes a section mark (§) is found in the Internet Reference Cited section.

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to drill on the Monitor property located northeast of the Ray Mine. Teck Cominco Ltd. began drilling for shallow and deep copper and silver target areas in November. Teck Cominco Ltd. obtained the legal rights to begin work at the Markham Wash geophysical prospect located in the Safford District in early 2006. BHP Billiton Ltd. obtained the legal rights to begin drilling on the Dragoon project where General Minerals has identified a 3-square-km- (1 mile) geophysical target. Redhawk Resources Inc. acquired a large land position totaling 18 square km (7 square miles) in the Copper Creek district that contains high level breccia pipes as well as porphyry style mineralization. The company is logging and relogging more than 120,000 m from previous drilling. It is also evaluating resources previously announced by AMT International Mining Corp. for three pipes to determine exploration and mining plans.

Southern Silver Exploration Corp. acquired an option in the Tombstone project, a multitarget porphyry skarn prospect 8 km (5 miles) southwest of the town of Tombstone. Nord Resources Corp. completed a geophysical induced polarization (IP) survey that identified an anomaly attributed to sulfide mineralization at depth on the Coyote Springs property in the Safford District.

Gold.—Precious metals benefited from increased prices. American Bonanza Gold Corp. completed a 40,000-m drill program at the Copperstone gold project in western Arizona. Golden Arch Resources Ltd. conducted exploration drilling at the Mildred Peak/Jupiter project in Pima County. Similarly, Terraco Gold Corp. conducted exploration drilling at the Golden Eagle/Bonanza project in La Paz County. Galaxy Minerals Inc. reported acquiring a small mill for its Yellow Jacket Mine in Santa Cruz County.

Government Programs

The Aggregate Mine Land Reclamation bill became law in May. It applies to aggregate operations started after April 1, 1997, with more than 2 hectares (5 acres) of private land. Existing operations must submit plans to the State Mine Inspector by January 1, 2007, and after that date, new mines require approval before beginning to operate. The bill requires financial assurance mechanisms and public community notification. It limits authority of flood control districts to regulate stability and capacity of floodplains.

The Maricopa County Board of Supervisors modified Rule 316, Nonmetallic Mineral Processing, which tightened dust emissions. It requires paving of dirt roads on sites, installation of rumble strips, wheel cleaners, and street sweepers.

Comments for the environmental assessment of the Drake Quarry (limestone for cement manufacture) located on Prescott Forest Service lands were due in December. Construction of the cement plant on adjacent private land may begin in the second half of 2006. Because of heightened concerns over the State's continuing drought and water supply in the Verde River watershed, USGS released OFR2004–1439 Hydrogeologic Review of the Drake Cement Project. Subsequently, Drake Cement LLC planned its operation to minimize water consumption.

The U.S. Supreme Court refused to hear the 9th Circuit Court of Appeals decision regarding the State of Arizona's refusal to buy aggregate materials from Dale McKinnon's private property known as Woodruff Butte. The Hopi, Navajo, and Zuni Indians have declared Woodruff Butte to be a sacred site. McKinnon claimed his rights were violated by the State not issuing commercial source approval, thus prohibiting sale of his aggregate materials to State projects.

For more details on the geology and distribution of metallic commodities, refer to the Arizona Department of Mines and Mineral Resource's new OFR23-06 Arizona's Metallic Resources - Trends and Opportunities posted at www.admmr.state.az.us.

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TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN ARIZONA[1, 2]

(Thousand metric tons and thousand dollars)

Mineral	2003		2004		2005	
	Quantity	Value	Quantity	Value	Quantity	Value
Copper[3]	741	1,390,000	723	2,130,000	690	2,640,000
Gemstones	NA	1,440	NA	1,450	NA	1,370
Sand and gravel:						
Construction	62,600	340,000	79,600	430,000	84,900	516,000
Industrial	W	W	W	792	W	W
Stone, crushed	9,950	49,100	14,100 r	75,900 r	12,000 [4]	69,300 [4]
Combined values of cement, clays (bentonite, common), gold, gypsum, (crude), lime, molybdenum concentrates, perlite (crude), pumice and pumicite, salt, silver, stone (crushed traprock [2005], dimension sandstone), zeolites (2004-05), and values indicated by symbol W	XX	394,000	XX	709,000	XX	1,120,000
Total	XX	2,180,000	XX	3,350,000 r	XX	4,350,000

rRevised. NA Not available. W Withheld to avoid disclosing company proprietary data. Withheld values included in "Combined value" data.
XX Not applicable.
[1]Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2]Data are rounded to no more than three significant digits; may not add to totals shown.
[3]Recoverable content of ores, etc.
[4]Excludes certain stones; kind and value included with "Combined values" data.

TABLE 2
ARIZONA: CRUSHED STONE SOLD OR USED, BY KIND[1]

Kind	2004			2005		
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Number of quarries	Quantity (thousand metric tons)	Value (thousands)
Limestone[2]	7 r	6,370 r	$27,400 r	7	6,340	$33,200
Marble	(3)	55	275	(3)	67	361
Granite	17 r	5,340 r	31,900 r	17	3,650	21,900
Traprock	2 r	375	2,860	2	W	W
Sandstone and quartzite	3	492	6,000	5	597	6,790
Volcanic cinder and scoria	7 r	177 r	980 r	5	151	813
Miscellaneous stone	5	1,310	6,490 r	3	1,250	6,180
Total	XX	14,100 r	75,900 r	XX	12,000	69,300

rRevised. W Withheld to avoid disclosing company proprietary data. XX Not applicable.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes limestone-dolomite reported with no distinction between the two.
[3]Sales/distribution yards.

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TABLE 3
ARIZONA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2005, BY USE[1]

(Thousand metric tons and thousand dollars)

Use	Quantity	Value
Construction:		
Coarse aggregate (+1½ inch), riprap and jetty stone	W	W
Coarse aggregate, graded, bituminous aggregate (coarse)	W	W
Coarse and fine aggregates:		
Graded road base or subbase	(2)	(2)
Terrazzo and exposed aggregate	(2)	(2)
Other coarse and fine aggregates	37	386
Total	1,040	13,800
Other construction materials	57	592
Agricultural, poultry grit and mineral food	W	W
Chemical and metallurgical:		
Cement manufacture	(2)	(2)
Lime manufacture	(2)	(2)
Total	3,950	19,600
Special, other fillers or extenders	(3)	(3)
Unspecified:[4]		
Reported	1,700	8,690
Estimated	4,400	24,000
Total	6,100	32,000
Grand total	12,000	69,300

W Withheld to avoid disclosing company proprietary data; included in "Grand total."
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Withheld to avoid disclosing company proprietary data; included in "Total."
[3]Less than ½ unit.
[4]Reported and estimated production without a breakdown by end use.

TABLE 4
ARIZONA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2005, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

	District 1		District 2		District 3		Unspecified districts	
Use	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Construction:								
Coarse aggregate (+1½ inch)[2]	W	W	--	--	--	--	--	--
Coarse aggregate, graded[3]	--	--	--	--	W	W	--	--
Coarse and fine aggregates[4]	W	W	--	--	W	W	--	--
Other construction materials	--	--	--	--	57	592	--	--
Agricultrual[5]	--	--	--	--	W	W	--	--
Chemical and metallurgical[6]	W	W	--	--	W	W	--	--
Special[7]	--	--	--	--	(8)	(8)	--	--
Unspecified:[9]								
Reported	111	662	351	1,890	5	29	1,230	6,110
Estimated	2,100	11,000	72	389	2,200	12,000	--	--
Total	4,650	27,000	423	2,280	5,750	33,900	1,230	6,110

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes riprap and jetty stone.
[3]Includes bituminous aggregate (coarse).
[4]Includes graded road base or subbase, terrazzo and exposed aggregate, and other coarse and fine aggregates.
[5]Includes poultry grit and mineral food.
[6]Includes cement and lime manufacture.
[7]Includes other fillers or extenders.
[8]Less than ½ unit.
[9]Reported and estimated production without a breakdown by end use.

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TABLE 5
ARIZONA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2005,
BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	16,000	$97,400	$6.08
Concrete products (blocks, bricks, pipe, decorative, etc.)[2]	529	6,310	11.92
Asphaltic concrete aggregates and other bituminous mixtures	3,370	23,200	6.89
Road base and coverings	8,550	43,500	5.09
Fill	1,200	5,360	4.48
Railroad ballast	15	218	14.38
Filtration	596	3,620	6.07
Other miscellaneous uses[3]	1,640	19,000	11.62
Unspecified:[4]			
Reported	42,100	252,000	6.00
Estimated	10,900	64,900	5.95
Total or average	84,900	516,000	6.08

[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.
[2]Includes plaster and gunite sands.
[3]Includes snow and ice control.
[4]Reported and estimated production without a breakdown by end use.

TABLE 6
ARIZONA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2005,
BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate (including concrete sand)	1,040	8,580	558	4,170	14,300	84,200
Concrete products (blocks, bricks, pipe, decorative, etc.)[2]	W	W	W	W	213	2,260
Asphaltic concrete aggregates and other bituminous mixtures	284	1,930	W	W	2,520	17,500
Road base materials	863	4,770	425	2,840	5,080	25,400
Fill	71	362	35	247	1,090	4,750
Other miscellaneous uses[3]	377	4,630	253	2,730	2,150	21,700
Unspecified:[4]						
Reported	5,000	30,200	791	4,820	35,300	215,000
Estimated	2,050	12,200	809	4,820	8,050	47,900
Total	9,690	62,700	2,870	19,600	68,700	419,000

	Unspecified district	
	Quantity	Value
Concrete aggregate (including concrete sand)	94	509
Concrete products (blocks, bricks, pipe, decorative, etc.)[2]	--	--
Asphaltic concrete aggregates and other bituminous mixtures	W	W
Road base materials	2,180	10,500
Fill	--	--
Other miscellaneous uses[3]	356	1,580
Unspecified:[4]		
Reported	968	1,870
Estimated	--	--
Total	3,590	14,400

W Withheld to avoid disclosing company proprietary data; included in "Other miscellaneous uses." -- Zero.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes plaster and gunite sands.
[3]Includes filtration, railroad ballast, and snow and ice control.
[4]Reported and estimated production without a breakdown by end use.

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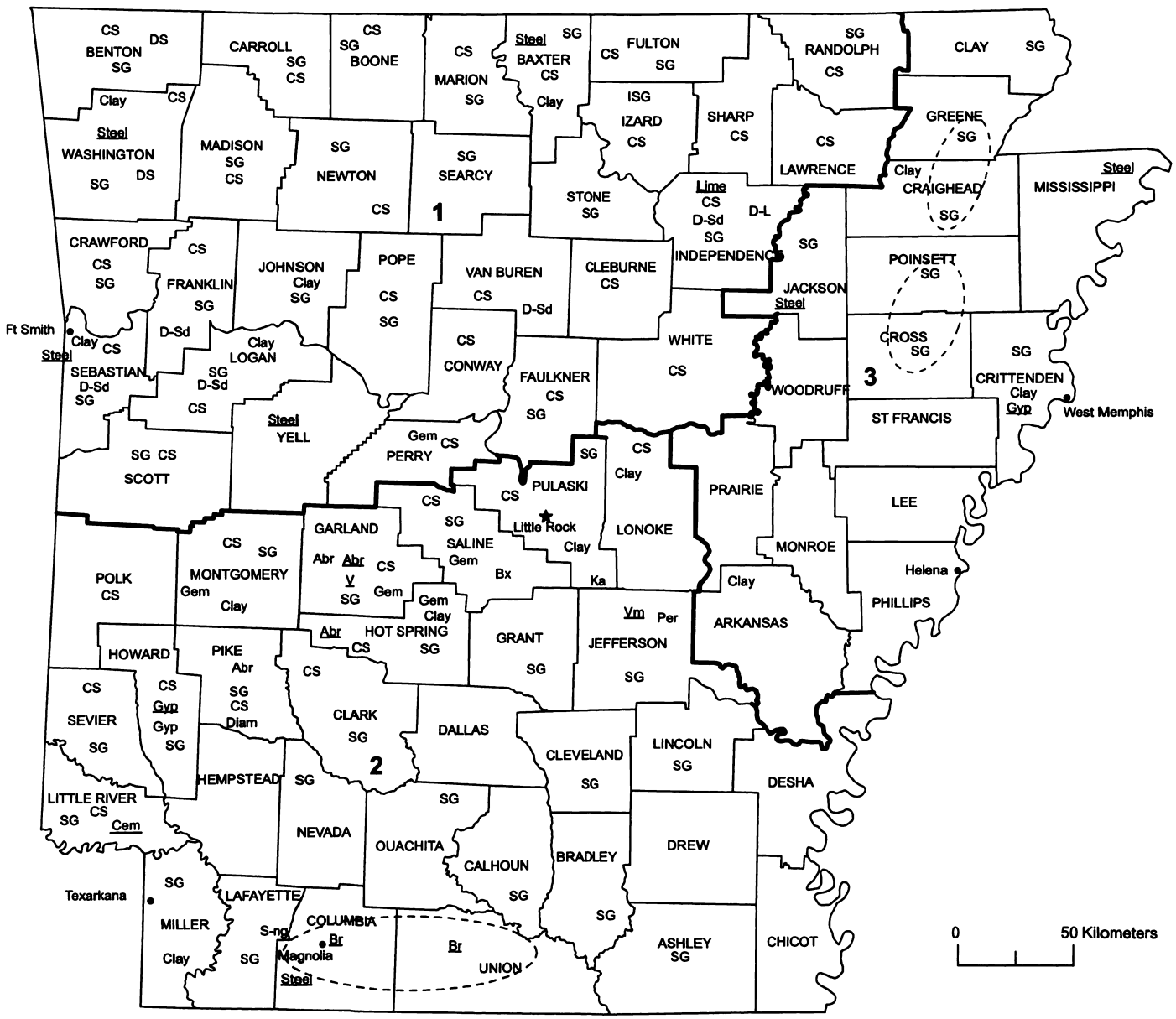
ARKANSAS



LEGEND

- County boundary
- Capital
- City
- 1 Crushed stone/sand and gravel districts

MINERAL SYMBOLS
(Major producing areas)

Abr	Abrasives
Abr	Abrasives plant
Br	Bromine plant
Bx	Bauxite
Cem	Cement plant
Clay	Common clay
CS	Crushed stone
Diam	Diamond
D-L	Dimension limestone
DS	Dimension stone
D-Sd	Dimension sandstone
Gem	Gemstones
Gyp	Gypsum
Gyp	Gypsum plant
ISG	Industrial sand and gravel
Ka	Kaolin
Lime	Lime plant
Per	Perlite
SG	Construction sand and gravel
S-ng	Sulfur (natural gas)
Steel	Steel plant
V	Vanadium plant
Vm	Vermiculite plant
	Concentration of mineral operations

Source: Arkansas Geological Commission/U.S. Geological Survey (2005)

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THE MINERAL INDUSTRY OF ARKANSAS

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Arkansas Geological Commission for collecting information on all nonfuel minerals.

In 2005, Arkansas' nonfuel raw mineral production was valued[1] at $591 million based upon annual U.S. Geological Survey (USGS) data. This was an 11.3% increase from the State's total value of $531 million of 2004, which followed a 17% increase from 2003 to 2004. The State was 32d in rank among the 50 States in total nonfuel mineral production value in 2005 and accounted for more than 1% of the U.S. total. Yet, per capita, the State ranked 16th in the Nation in its minerals industry's value of nonfuel mineral production; with a population of about 2.8 million, the value of production was about $210 per capita.

In 2005, crushed stone, followed by bromine, cement (portland and masonry), and construction sand and gravel, were Arkansas' leading nonfuel minerals by value; altogether these commodities accounted for 90% of the State's total nonfuel mineral value. For nearly four decades, bromine and crushed stone, by value, have been the State's two leading nonfuel minerals, bromine leading in value from 1969 up to 1996 when crushed stone went from second to first. Since then the two have exchanged rank several times; crushed stone was first in 1996-98, in 2001-03, and again in 2005, and bromine in the intervening years. For more than a decade, cement has ranked third and construction sand and gravel has ranked fourth. Actual production data for bromine and cement have been withheld (company proprietary data).

In 2005, with a modest 4% increase in production, crushed stone value rose nearly 30%, up $50 million, followed by significant increases in cement, construction sand and gravel (up $8.5 million), and gypsum. The value of gemstones was up about 20%. The only decreases in production value took place in bromine (small increase in tons produced), silica stone, and tripoli, the most substantial being that of bromine (table 1).

Arkansas continued to be the leading bromine-producing State and accounted for most U.S. production in 2005. Michigan was the only other State that produced bromine. Mining operations in both States extracted subsurface, bromine-rich natural brines by submersible pump for subsequent processing. Arkansas continued to be the only State that produced silica stone and third in the quantities of tripoli of four producing States. Even with a 50% increase in gypsum production, the State remained sixth in rank among other producing States. Arkansas rose to fifth from eighth in gemstones (based upon value) and to sixth from seventh in the production of common clays. Additionally, significant quantities of crushed stone, construction sand and gravel, lime, and industrial sand and gravel were produced in the State.

Metals that were produced in the State—for the most part raw steel—were processed from materials acquired from other domestic and foreign sources. The principal steel mills in the State were Quanex Corp. in Sebastion County and Nucor-Yamato Steel Co. and Nucor Corp. in Mississippi County. The mills have a combined capacity of 4.9 million metric tons per day. Strategic Minerals Corp., or Stratcor, continued operation of the mill facility at Potash Sulphur Springs in Garland County; the mill extracts vanadium pentoxide from recycled out-of-State vanadium-bearing feed.

The Arkansas Geological Commission[2] (AGC) provided the following narrative information.

Exploration and Development

Numerous companies were actively involved in exploring for construction sand and gravel and crushed stone, especially in the western, northwestern, and central portions of the State. Arkhola Sand and Gravel Co. continued to explore for additional quarry sites in the western portion of the Arkansas River Valley, and Duffield Stone and Gravel Co. also continued its exploration program in the Arkansas River Valley. Granite Mountain Quarries, Inc. continued evaluating two western Arkansas sites—one in the lower Atoka Formation west of Boles in southern Scott County and another in the Hartshorne Sandstone west of Greenwood in Sebastian County. Martin Marietta Co. acquired new leases for properties east of the company's Hatton Quarry in southern Polk County in the direction of and near to the Cossattot River. Texas Industries Group continued to evaluate tuff deposits on leases in southern Polk County. McClinton-Anchor, Inc. continued to explore for new aggregate quarry sites in the limestone-bearing region of northwest Arkansas. Rogers Group Inc. was also evaluating new quarry sites in northwest Arkansas in the Boone Formation and Pitkin Formation (both Mississippian age). Vulcan Materials Co. continued aggregate exploration, focusing mainly on Morrowan age and Atokan age sandstones in White County and Cleburne County, north of central Arkansas.

For construction sand and gravel operations alone, 29 quarry notifications of intent were on file by yearend 2005. The majority of these operations were in the southeastern part of the State in the Gulf Coastal Plain.

[1]The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2005 USGS mineral production data published in this chapter are those available as of December 2006. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—can be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

[2]J. Michael Howard, Geology Supervisor/Mineralogist, authored the text of the State mineral industry information provided by the Arkansas Geological Commission.

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Industrial Minerals

Bromine.—Albermarle Corp. and Chemtura Corp., formerly Great Lakes Chemical Corp., continued operations at their bromine extraction and production plants in Columbia and Union Counties, respectively. Prices for bromine-based products steadily increased worldwide during the year. Chemtura secured a long-term supply of chlorine by partnering with ASHTA Chemicals Inc., which plans to build a new chloralkali production facility adjacent to Chemtura's central plant in El Dorado, AR. The agreement will supply Chemtura with a long-term, steady supply of chlorine for use primarily in the production of bromine at its three El Dorado facilities. Expansion of the elemental bromine and PBS (polydibromostyrene) flame retardant facilities was completed during the first quarter of 2005. Chemtura Corp. was formed in July, when Great Lakes Chemical Corp. merged with Crompton Corp.

Cement.—Ash Grove Cement Co., which was the sole producer of cement in the State, operated the Foreman plant in Little River County using chalk from the Annona Formation and silica from the Marlbrook Formation (both Cretaceous). Arkansas Lime Co. of Batesville, Independence County, produced quicklime, hydrated lime, and pulverized limestone for glass manufacturing and agriculture lime. Their quarry is in a section of the Boone Formation (Mississippian) that is high purity, being low in silica (chert).

Common Clays.—Acme Brick Co., owned by Berkshire-Hathaway, is near Malvern in Hot Spring County. Acme continued operation of its Wilcox Group (Eocene) clay mines for brick production at Perla. McGeorge Construction Company began custom mining of bauxite for a customer on ALCOA property in Saline County.

Construction Sand and Gravel.—In 2005, eight new sand and gravel operations were permitted by the Surface Mining and Reclamation Division of the Arkansas Department of Environmental Quality, bringing the total number to 113. In 2005, Ouachita Builders opened a new gravel operation near Norman in Montgomery County from which the company produced Quaternary age novaculite and chert gravel.

Crushed Stone.—Arkhola Sand and Gravel produced road aggregates and asphalt mix at the Preston Quarry near Van Buren in Crawford County. Arkhola continued to work a quarry in the Hartshorne Sandstone near the Jenny Lind Mine in Sebastian County. Bobby Plant Asphalt Co., based in Murfreesboro, Pike County, produced crushed stone from its quarry in the Jackfork Sandstone Formation.

Duffield Stone and Gravel operated two Pennsylvanian age sandstone aggregate quarries in Pope County—one in the Hartshorne Sandstone at Russellville, and the other in the Gumlog Quarry, in the upper Atoka Formation. Pyramid Co. produced aggregate from the middle Atoka Formation (Pennsylvanian age) north of Greenbriar in Faulkner County. Granite Mountain produced aggregate from nepheline syenite at two quarries in Pulaski County and from the Granite Mountain No. 3 Quarry near Bryant in Saline County. Martin Marietta Co. actively quarried the Hatton Tuff lentil of the Stanley Group (Mississippian age) at the Hatton Quarry in southern Polk County, and the company made plans for the installation of a third crusher and processing unit at this site. Martin Marietta continued operations at the Jones Mill Quarry near Magnet Cove in Hot Spring County and produced from both the hornfels and quartzite alteration zone in the Stanley Group adjacent to the Cretaceous igneous intrusion and the intrusive. The company operated an asphalt plant at this site.

The Rogers Group continued sandstone aggregate operations at its Greenbriar Quarry in the middle Atoka Formation in Faulkner County, at its Conway County Quarry in the upper Atoka Formation south of Solgohachia, about 80 kilometers northwest of Little Rock, and at its Lowell Quarry in the limestone of the Boone Formation (Mississippian age) in southern Benton County. Schwartz Stone Co. quarried sandstone from the Hartshorne Sandstone for aggregate and dimension stone north of Midway in Logan County. McGeorge Sand and Gravel Co. continued riprap barge operations along the Arkansas River from its River Mountain Quarry in the Hartshorne Sandstone area north of New Blaine in eastern Logan County. Chrisman Co. mined sandstone aggregate in the Hartshorne Sandstone area near Hunt in Johnson County and from the Savanna Formation near Ratcliffe in Franklin County.

Vulcan Materials Co., based in Birmingham, AL, produced aggregate from its upper Morrowan age sandstone operations at Judsonia and middle Atokan age sandstones at Floyd, both sites in White County. Vulcan also produced dolomitic limestone from lower Ordovician age units near Black Rock in Lawrence County. The company also closed its sandstone aggregate operation at Heber Springs in Cleburne County. Webco Mining produced crushed stone from its quarry in the middle Atoka Formation near El Paso in White County. Quality Stone Co. continued operation at the Lonestar Quarry (opened in 2004) in south Cleburne County north of Rosebud community. The company produced sandstone aggregate from the Atoka Formation (Pennsylvanian age). Midwest Lime Co. produced aggregate from middle and upper Ordovician-age limestones near Batesville, Independence County. Limestone Specialties, Inc. shipped by rail the aggregate that it produced from upper Ordovician units in Independence County.

Dimension Stone.—Oran McBride Stone Co. of Batesville in Independence County continued production of interior and exterior structural and architectural stone at its plant in Bethesda. Polished, cut, and rough surface marble, limestone, and sandstone were quarried from Ordovician and Mississippian-age formations and processed. Bennett Brothers Stone Co., Inc. obtained building stone materials from deposits in Franklin, Logan, Garland, and other counties, principally from Pennsylvanian age formations.

Gypsum.—In 2005, BPB Gypsum Inc., which is near Nashville in Howard County, continued to be the world's largest wallboard manufacturing plant, with a capacity of 130 million square meters per year. Altogether, the plant and mines employed about 200 people in 2005. The principal markets for the wallboard were in the eastern United States; the wallboard was shipped by rail and truck.

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Industrial Sand and Gravel.—Industrial sand was produced by Unimin Corp. from their mine and facility in Izard County. The source unit is the Ordovician St. Peter Sandstone and markets which include glass and foundry uses.

Nepheline Syenite.—Minnesota Mining and Manufacturing Co. mined nepheline syenite from its Big Rock Arch Street Quarry to supply its roofing granule plant in Sweet Home, Pulaski County. Martin Marietta abandoned concurrent mining of syenite dike rock for aggregate in this quarry.

Other Industrial Minerals.—Mark Wallis Whetstones, Inc. continued sporadic operation of a whetstone-grade novaculite mine south of Lonsdale near the Saline-Hot Spring County line. Smith Whetstone, Inc. of Hot Springs in Garland County manufactured a variety of grades of oilstones (whetstones) from its Arkansas Novaculite (Mississippian-Devonian age) quarry operations. Dan's Whetstones Company, Inc. also of Hot Springs, continued mining, processing, and marketing whetstone products from the company's quarry operation in the Arkansas Novaculite. Martin Marietta obtained control of the Butterfield Quarry in Hot Spring County, formerly operated by Ouachita Gravel Company, Inc. in 2004, but the whetstone-grade novaculite quarry was inactive during 2005. Martin Marietta also produced high-silica novaculite as well as aggregate from a quarry near Glen Rose in Hot Spring County.

Malvern Minerals Co. of Hot Springs, Garland County, produced tripoli from its mine in the Bigfork Chert (Middle and Late Ordovician age).

Certain-Teed Co. continued mining and processing of slaty shale from the Mississippian Stanley Formation north of Glenwood in Pike County, producing black roofing granules.

Environmental Issues and Mine Reclamation

Alcoa Inc. was essentially finished with a 20-year land reclamation project of former bauxite properties adjacent to the community of Bauxite in Saline County. Alcoa's last 81 hectares (ha) of permitted land was taken over by McGeorge Contracting Company, Inc. under a new permit to mine additional bauxite. Umetco, Inc. continued the reclamation of the Wilson Springs vanadium mines area in Garland County that began in 1997 with work on the Lecroy Spoil area. The Black Lick diamond property, which was reclaimed in 2004 by Star Resources Corp. of Houston, TX, is northeast of the Crater of Diamonds State Park in Pike County; at yearend, Star Resources was awaiting release of its bond money.

Government Legislation, Programs, and Activities

During 2005, 204 noncoal mine sites were active, permitted, or authorized in Arkansas. The total noncoal area under permit was nearly 5,000 ha, and 3,606 ha under bond. There were 178 ha of reclaimed land released from 2 permitted sites during 2005. During the 2005 State legislative session, Act 855 of 2005 was passed that gave the Arkansas Department of Environmental Quality the authority to develop and issue general permits under the Non-Coal Program. Regulation 15 was modified to incorporate the new legislation and it was promulgated on May 28, 2006.

Crater of Diamonds State Park in southwest Arkansas near Murfreesboro is the world's only diamond-bearing site that is open to the public. Diamonds that visitors find are the finders to keep; on average about two are found per day. In 2005, 536 diamonds were recovered at the park. The total carat weight of the stones was 103.43, with an average weight of 0.19 carats. Of these 536 diamonds, 19 weighed more than 1 carat. Diamonds recovered included white—310, brown—137, and yellow—89. The largest diamond recovered in 2005 was a lemon-yellow, gem-quality stone that weighed 3.36 carats. More than 25,000 diamonds have been recovered since this property became a State park in 1972. Plans for the park include a new museum. In 2005, a small area of new ground was opened to collecting, bringing the total search area to about 16.2 ha.

Operators of 27 quartz contracts with the U.S. Department of Agriculture's Forest Service on the Ouachita National Forest in Arkansas generated about $13,500 in revenue and approximately $5,000 more on three producing leases.

The AGC Web site at http://www.state.ar.us/agc/agc.htm hosted more than 131,000 visitors in 2005, its 7th year of online operation; the number of visitors represented a 34% increase compared with that of 2004. Information posted on the Web site included AGC agency services; Arkansas Board of Registration for Professional Geologists; news items; publications and map ordering information; State resource data; State stratigraphic, geologic and geohazard data; and USGS annual nonfuel mineral production data. The site included links to State agency services, Federal agencies, geology Web sites, organizations, and universities.

The AGC staff also continued preparation of a spreadsheet database that contains all identified sites of mineral extraction in the State, excluding petroleum and natural gas. By the close of 2005, more than 7,300 entries had been made. Approximately 45% of those entries remained to be field checked. Sites are located by latitude and longitude and by general land office survey techniques. Fieldwork began in October to check data on a county-by-county basis.

The AGC has been an active participant in the STATEMAP program since 1995. STATEMAP is a component of the congressionally mandated National Cooperative Geologic Mapping Program (NCGMP), through which the USGS distributes Federal funds to support geologic mapping efforts through a competitive funding process. The NCGMP has three primary components: (1) FEDMAP, which funds Federal geologic mapping projects, (2) STATEMAP, which is a matching-funds grant program with State geological surveys, and (3) EDMAP, a matching-funds grant program with universities that has a goal to train the next generation of geologic mappers. During 2005, three digitized 7.5-minute USGS topographic geologic maps were completed under the STATEMAP cooperative agreement, and three additional maps were started. Staff cartographers completed the digitization of an additional nine USGS 7.5-minute topographic geologic maps, primarily in southwestern Arkansas, with legends. An effort has been undertaken to digitize all or part of 10 USGS topographic geologic maps scaled 1:100,000 in west-central Arkansas. Additional information about the STATEMAP geologic mapping program in Arkansas can be found on the AGC Web

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site. Digitized 7.5-minute geologic maps are available on the AGC Web site and can be downloaded as .pdf files for free.

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN ARKANSAS[1, 2]

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral		2003 Quantity	2003 Value	2004 Quantity	2004 Value	2005 Quantity	2005 Value
Clays, common		897	1,410	1,150	1,510	1,210	1,900
Gemstones		NA	477	NA	590	NA	711
Sand and gravel, construction		9,720	52,100	9,370	53,500	10,600	62,000
Silica stone[3]	metric tons	513	3,630	655	3,660	576	2,290
Stone, crushed		29,700	145,000	34,100 r, 4	173,000 r, 4	35,400 4	223,000 4
Combined values of bromine, cement, clays (kaolin), gypsum (crude), lime, sand and gravel (industrial), stone (crushed slate [2004-05], dimension limestone and sandstone), tripoli		XX	252,000	XX	299,000 r	XX	302,000
Total		XX	454,000	XX	531,000 r	XX	591,000

rRevised. NA Not available. XX Not applicable.
[1]Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2]Data are rounded to no more than three significant digits; may not add to totals shown.
[3]Grindstones, pulpstones, and sharpening stones; excludes mill liners and grinding pebbles.
[4]Excludes certain stones; kind and value included with "Combined values" data.

TABLE 2
ARKANSAS: CRUSHED STONE SOLD OR USED, BY KIND[1]

Kind	2004 Number of quarries	2004 Quantity (thousand metric tons)	2004 Value (thousands)	2005 Number of quarries	2005 Quantity (thousand metric tons)	2005 Value (thousands)
Limestone	27	11,900 r	$54,200 r	27	13,500	$81,700
Dolomite	2	1,290	8,080	1	W	W
Granite	5	9,620	48,600 r	4	9,320	59,600
Sandstone and quartzite	19	10,500	58,100 r	18	10,500	67,400
Slate	1	W	W	1	W	W
Miscellaneous stone	3	801	3,980	3	676	4,140
Total	XX	34,100 r	173,000 r	XX	35,400	223,000

rRevised. W Withheld to avoid disclosing company proprietary data. XX Not applicable.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.

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TABLE 3
ARKANSAS: CRUSHED STONE SOLD OR USED BY PRODUCERS
IN 2005, BY USE[1]

(Thousand metric tons and thousand dollars)

Use	Quantity	Value
Construction:		
Coarse aggregate (+1½ inch):		
Riprap and jetty stone	204	1,410
Filter stone	137	913
Other coarse aggregate	176	955
Total	517	3,280
Coarse aggregate, graded:		
Concrete aggregate, coarse	1,470	11,500
Bituminous aggregate, coarse	493	4,180
Bituminous surface-treatment aggregate	376	3,800
Railroad ballast	20	89
Other graded coarse aggregate	478	3,520
Total	2,830	23,100
Fine aggregate (-⅜ inch):		
Stone sand, concrete	W	W
Stone sand, bituminous mix or seal	62	426
Screening, undesignated	698	3,250
Other fine aggregate	213	1,410
Total	973	5,080
Coarse and fine aggregates:		
Graded road base or subbase	2,960	18,800
Unpaved road surfacing	630	4,250
Crusher run or fill or waste	215	790
Other coarse and fine aggregates	1,850	11,600
Total	5,660	35,400
Other construction materials	77	338
Agricultural:		
Limestone	179	1,130
Poultry grit and mineral food	(2)	(2)
Other agricultural uses	62	879
Total	241	2,010
Chemical and metallurgical:		
Cement manufacture	(3)	(3)
Lime manufacture	(3)	(3)
Glass manufacture	(3)	(3)
Special:		
Asphalt fillers or extenders	(3)	(3)
Other fillers or extenders	(3)	(3)
Other miscellaneous uses; waste material	(4)	(4)
Unspecified:[5]		
Reported	13,100	85,700
Estimated	9,700	59,000
Total	22,700	145,000
Grand total	35,400	223,000

W Withheld to avoid disclosing company proprietary data; included with "Other fine aggregate."
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Withheld to avoid disclosing company proprietary data; included with "Other agricultural uses."
[3]Withheld to avoid disclosing company proprietary data; included in "Grand total."
[4]Withheld to avoid disclosing company proprietary data; included with "Unspecified: Reported."
[5]Reported and estimated production without a breakdown by end use.

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TABLE 4
ARKANSAS: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2005,
BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Construction:						
Coarse aggregate (+1½ inch)[2]	516	3,270	W	W	W	W
Coarse aggregate, graded[3]	2,810	22,900	W	W	W	W
Fine aggregate (-⅜ inch)[4]	W	W	--	--	W	W
Coarse and fine aggregates[5]	5,560	34,700	W	W	W	W
Other construction materials	77	338	--	--	--	--
Agricultural[6]	241	2,010	--	--	--	--
Chemical and metallurgical[7]	W	W	W	W	--	--
Special[8]	W	W	W	W	--	--
Other miscellaneous uses[9]	--	--	(10)	(10)	--	--
Unspecified:[11]						
Reported	6,920	43,800	6,140	41,900	--	--
Estimated	3,900	24,000	5,700	35,000	--	--
Total	21,800	142,000	13,500	80,300	36	423

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes filter stone, riprap and jetty stone, and other coarse aggregate.
[3]Includes bituminous aggregate (coarse), bituminous surface-treatment aggregate, concrete aggregate (coarse), railroad ballast, and other graded coarse aggregate.
[4]Includes screening (undesignated), stone sand (bituminous mix or seal), stone sand (concrete), and other fine aggregate.
[5]Includes crusher run or fill or waste, graded road base or subbase, unpaved road surfacing, and other coarse and fine aggregates.
[6]Includes agricultural limestone, poultry grit and mineral food, and other agricultural uses.
[7]Includes cement, lime, and glass manufacture.
[8]Includes asphalt fillers or extenders and other fillers or extenders.
[9]Includes waste material.
[10]Withheld to avoid disclosing company proprietary data; included with "Unspecified: Reported."
[11]Reported and estimated production without a breakdown by end use.

TABLE 5
ARKANSAS: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2005,
BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate and concrete products	2,850	$17,300	$6.07
Asphaltic concrete aggregates and other bituminous mixtures	943	6,540	6.94
Road base and coverings	316	1,500	4.73
Fill	277	1,860	6.69
Snow and ice control	15	118	8.09
Other miscellaneous uses	37	1,100	29.78
Unspecified:[2]			
Reported	4,490	24,200	5.40
Estimated	1,670	9,380	5.62
Total	10,600	62,000	5.85

[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.
[2]Reported and estimated production without a breakdown by end use.

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TABLE 6

ARKANSAS: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2005, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregates and concrete products	379	2,980	1,420	7,880	1,050	6,450
Asphaltic concrete aggregates and other bituminous mixtures	W	W	W	W	W	W
Road base and coverings	--	--	163	976	153	519
Fill	70	671	206	1,180	1	3
Other miscellaneous uses[2]	47	450	793	5,570	155	1,540
Unspecified:[3]						
Reported	1,860	10,300	1,580	7,930	995	5,650
Estimated	710	3,990	822	4,620	137	768
Total	3,070	18,400	4,980	28,400	2,490	14,900

	Unspecified district	
	Quantity	Value
Concrete aggregates and concrete products	--	--
Asphaltic concrete aggregates and other bituminous mixtures	--	--
Road base and coverings	--	--
Fill	--	--
Other miscellaneous uses[2]	--	--
Unspecified:[3]		
Reported	54	336
Estimated	--	--
Total	54	336

W Withheld to avoid disclosing company proprietary data; included in "Other miscellaneous uses." -- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes snow and ice control.

[3]Reported and estimated production without a breakdown by end use.

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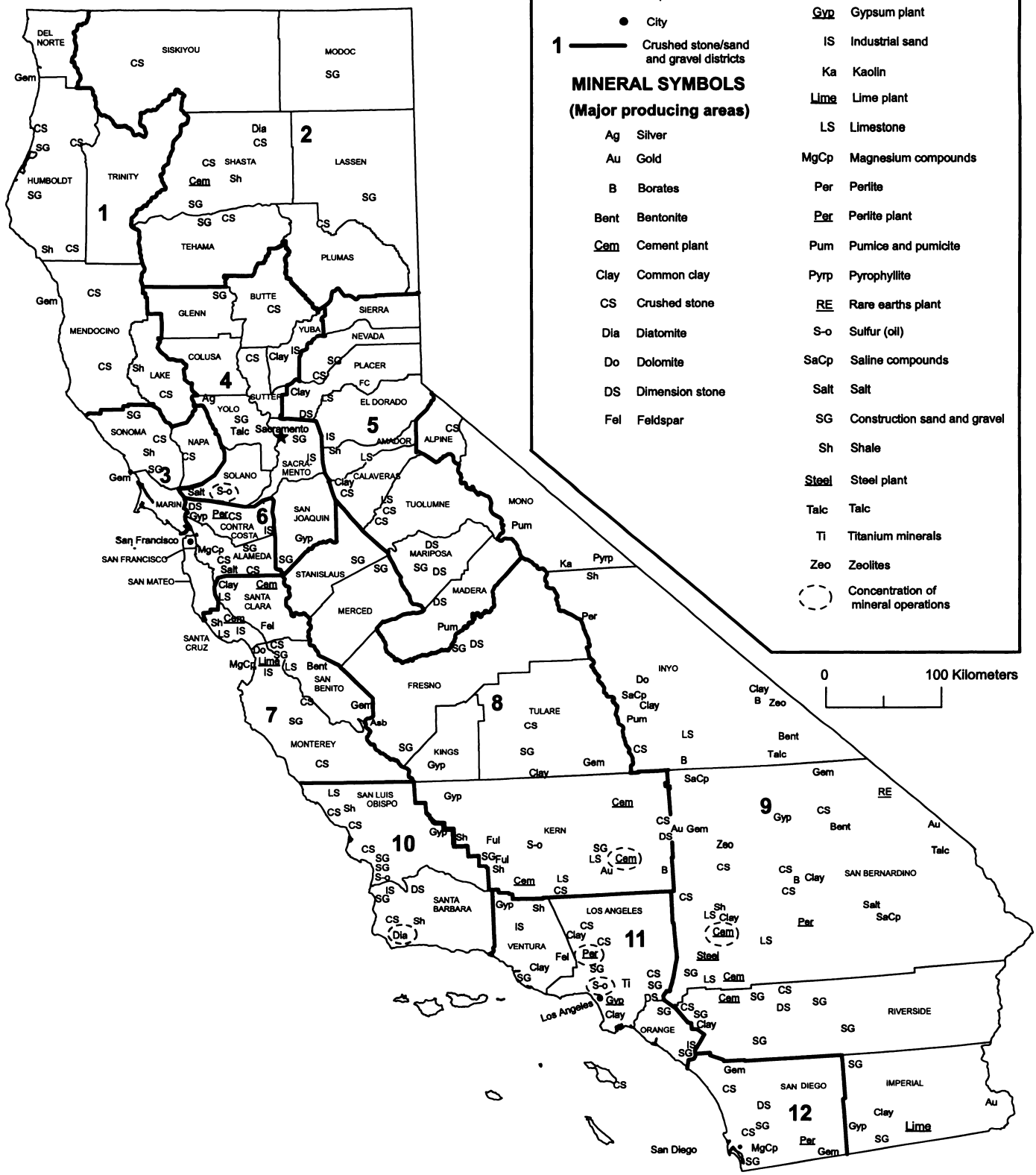

Source: California Department of Conservation, California Geological Survey/U.S. Geological Survey (2005)

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THE MINERAL INDUSTRY OF CALIFORNIA

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the California Geological Survey for collecting information on all nonfuel minerals.

In 2005, California's nonfuel raw mineral production was valued[1] at $4.24 billion, on the basis of annual U.S. Geological Survey (USGS) data, an increase of 12.7% from the 2004 value, which was up by 9.3% from 2003. The State was second in rank among the 50 States in total nonfuel mineral production value in 2005, following 6 consecutive years as first in the Nation. California accounted for 7.7% of the U.S. total.

Industrial minerals accounted for more than 98% of California's nonfuel mineral value; the remaining value resulted from the mining of gold, silver, and iron ore (descending order of value). In 2005, California continued as the leading construction sand-and-gravel-producing State, again accounting for more than 13% of the commodity's total U.S. mine production and 19.3% of the Nation's total value for that mineral commodity. Construction sand and gravel was, by value, also the State's leading nonfuel mineral, accounting for 34% of the State's total nonfuel mineral production value. Cement (portland and masonry) was the second ranked nonfuel mineral, followed by boron minerals, crushed stone, soda ash, and diatomite; these six accounted for nearly 95% of the State's total industrial mineral value (table 1).

In 2005, increases in the values of construction sand and gravel (up by $160 million), portland cement (up by $130 million), crushed stone (up by $91 million), and boron (up by $87 million), led California's significant increase in nonfuel mineral production value for the year. The production of each of these commodities showed relatively small-to-only-slight decreases in production, indicating higher overall unit values for each. With smaller yet significant increases in value, a similar pattern of production decrease was evident for lime and soda ash. Also showing smaller yet significant increases in value (in descending order of change) were masonry cement, gypsum, industrial sand and gravel, and salt, each having an increase in unit value. The largest decreases in value for the State's nonfuel mineral commodities were those of gold and common clays. All other changes in value were about $1 million or less (table 1).

California continued to be the Nation's only State to produce boron in 2005 and it remained first in the quantities of construction sand and gravel and of portland cement produced (descending order of value), and it also remained the first of four diatomite-producing States. The State continued to rank second among three States that produced soda ash; second in masonry cement; third in feldspar; fourth in gemstones (based upon value); fifth in gypsum, perlite, and magnesium compounds; and seventh in fuller's earth. Although California rose to 3d from 5th in the production of pumice and pumicite, to 4th from 5th in industrial sand and gravel, and to 9th from 10th in salt, it decreased to 8th from 5th in gold, to 8th from 7th in bentonite, and to 9th from 6th in common clays. Additionally, California was a significant producer of crushed stone and dimension stone.

The following narrative information was provided by the California Geological Survey (CGS).[2] In 2005, approximately 9,500 people were employed at the mines and mineral processing plants of about 820 active mines that produced nonfuel minerals in California.

Commodity Review

Industrial Minerals

Boron.—California produced nearly 25% of the world's boron. On the basis of annual USGS data, the State's boron (minerals) production was valued at $713 million and was its third-highest dollar value nonfuel mineral (table 1). Boron was produced by four companies at five different facilities in the State. Production decreased by 5% for the year to 1.15 million metric tons (Mt), but a higher dollar value per metric ton (t) contributed to a nearly 14% increase in its total value from that of 2004. U.S. Borax and Chemical Inc. (a subsidiary of Rio Tinto Inc.) led the State (and the Nation) in the production of boron at its open pit mine in Boron, CA, in southeastern Kern County.

Cement.—Although the total value of portland cement in California in 2005 rose by 13% to $1.13 billion (on the basis of USGS data), the State experienced a shortage of portland cement in 2005, driving the average (estimated) price up from 2004 by nearly 16% to more than $97 per metric ton (table 1). Portland cement production for 2005 amounted to 11.6 Mt, down from 11.9 Mt in 2004 (table 1). CEMEX S.A.B de C.V. (CEMEX) completed the acquisition of the worldwide assets of RMC Group plc of the United Kingdom, including RMC Pacific Materials Inc.'s cement plant in Davenport (western Santa Cruz County), on March 1. The overall acquisition, including the $5.8 billion acquisition of the RMC Davenport, CA, plant and a number of concrete plants, resulted in CEMEX becoming one of the world's leading producers of ready-mixed concrete (van Oss, 2007, p. 16.4) and the third ranked cement producer in the world.

Texas Industries, Inc. announced plans in April to expand and modernize the company's Oro Grande portland cement plant in San Bernardino County. The 2-year, $360 million project will increase the facility's annual cement capacity from 1.1 Mt to 2.1 Mt.

[1]The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2005 USGS mineral production data published in this chapter are those available as of December 2006. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—can be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

[2]Susan Kohler, Senior Engineering Geologist, authored the text of information submitted by the California Geological Survey.

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Also in San Bernardino County, Mitsubishi Cement Corp.'s planned startup date of May 2005 for its newly approved 81-hectare (ha) expansion of its Cushenbury Limestone Mine was not met. The company was in the process of mitigating the environmental impacts associated with the expansion that was approved in October 2004, which added about 45 Mt of cement-grade limestone reserves.

Construction Sand and Gravel.—Vulcan Materials Co. was California's leading producer of construction sand and gravel (Bolen, 2007§[3]). Teichert Aggregates' (a subsidiary of A. Teichert & Son, Inc.) Aspen VI pit and plant operation in Sacramento County was the State's single-leading sand-and-gravel-producing operation and was second in the Nation only to California Portland Cement Co.'s Dupont Pit in Pierce County, WA.

Importation of sand and gravel by ship and barge from Canada and Mexico to California ports continued through the bay areas of Los Angeles, San Diego, and San Francisco. California imported nearly 2.2 Mt of sand and gravel during 2005 compared with about 3 Mt in 2004. Hanson Building Materials America Inc. (Hanson Aggregates) was the leading importer of aggregate in the State.

Hanson Aggregates purchased Mission Valley Rock Co.'s Sunol sand and gravel operation in Alameda County in June. The acquisition took place 6 months after the California Court of Appeals of the First District upheld a 2003 State Superior Court decision that allowed a 56-ha (139-acre) expansion of Mission Valley Rock's existing Sunol operation. The mine expansion added 39 Mt of construction-grade sand and gravel reserves to mine for likely use in the south San Francisco Bay area, which was in short supply of sand and gravel aggregate. Hanson planned to start production from the expansion site by summer 2006. The company also purchased Berkeley Ready Mix Co. Inc. and Berkeley Asphalt Co. in 2005. The two companies operated plants in the Berkeley, Oakland, and Sunol areas.

Kaweah River Rock Co. was granted a permit by the Tulare County Board of Supervisors in June to mine 113 ha of land south of the company's existing operation along the Kaweah River. The permit added about 14-18 Mt of alluvial sand and gravel reserves to the northern Tulare County area. Local residents appealed the Board's approval and the project was put on hold until a decision could be made on the appeal.

CEMEX California Cement LLC was granted a permit in December to build a 4.5-million-metric-ton-per-year (Mt/yr) aggregate processing plant near Apple Valley, San Bernardino County. At the plant, high-quality concrete-grade aggregate will be made of waste rock from CEMEX California's Black Mountain Limestone Quarry. About 9 Mt of waste rock was already stockpiled at the Quarry. The rock was to be hauled about 3 kilometers by truck to the new processing plant, which was scheduled for completion in 2008. CEMEX California planned to run the plant at full capacity, which would make it one of the leading aggregate operations in the State.

Robertson's Ready Mix Concrete Inc. commenced mining at the Cushenbury Sand and Gravel Mine in San Bernardino County in the spring, having purchased the nearly 110-ha property from Crushed Rock Products Inc. in December 2004. A mining permit to operate the mine had been approved back in 1993, but no mining activities took place until Robertsons acquired the property. Robertson's Cushenbury mine contains nearly 23 Mt of construction-grade sand and gravel reserves that may be mined through the year 2023.

Teichert Aggregates was granted approval in July to remove from 10.9 to 13.6 Mt of gold dredge tailings located on 236 ha within the City of Rancho Cordova in Sacramento County. The tailings were to be transported by conveyor to the company's Grantline plant and then be processed for use in construction aggregate. Teichert estimated that it would take from 4 to 7 years to mine and remove the tailings. Upon completion, the land would be reclaimed to its original pre-gold mining topography. Elliot Homes, Inc. of nearby Folsom planned to build 12,000 new homes and provide about 37 ha (91 acres) of commercial space on the reclaimed site.

Syar Industries Inc. was given final approval in August to mine 14.7 ha of alluvial sand and gravel along the Russian River near Healdsburg in Sonoma County. The permit allowed for approximately 3 Mt of concrete-grade alluvial sand and gravel to be mined from the site by April 15, 2006, although, anticipating the need, Syar planned to apply for an extension of the mining deadline. Material mined at the site, referred to as Phase VI, was to be stockpiled at Syar's Healdsburg aggregate plant to be sold as needed.

Crushed Stone.—Granite Rock Co. Inc.'s Wilson Quarry was California's leading crushed rock producer for 2005. San Benito Supply Inc.'s Hidden Canyon Rock Quarry project, which is located near Greenfield in Monterey County, was approved in March. The permit allowed for approximately 6.4 Mt of crushed granite and 3.2 Mt of decomposed granite to be mined during a period of 20 years. A maximum of about 272,000 t (300,000 short tons) of rock may be mined annually from the site.

Industrial Sand and Gravel.—The H. Lima Co.'s Loop Ranch Limestone Mine project, near Tehachapi in Kern County, was approved in July. The 113-ha mine will provide nearly 4.5 Mt of limestone for use as fertilizer, as well as for such industrial uses as ceramics, glass manufacturing, and roofing. Mining was expected to start in the spring of 2006.

Blue Mountain Minerals (a subsidiary of The Portola Co.) was granted a permit in August to increase the production of limestone at two marble quarry sites in Tuolumne County from about 735,000 t to 1.07 Mt/yr. The approval was contingent on combining the company's Blue Mountain Quarry and Columbia Quarry into one permit and one reclamation plan. Blue Mountain mines limestone for use in glass manufacturing, poultry feed, and asphalt roofing shingles.

Rare Earths.—As required by California's Environmental Quality Act (CEQA), an Environmental Impact Report (EIR) was submitted and a subsequent permit was approved for Molycorp, Inc.'s Mountain Pass Mine in San Bernardino County in July 2004 to enlarge the current pit and construct a new onsite tailings impoundment and evaporation pond for the mine. The new permit allows the existing pit to be mined down to nearly 230 meters (m) below ground surface (an additional 76 m), thereby increasing the mine life by 30 years. However, competition from rare-earth producers in China has

[3]References that include a section mark (§) are found in the Internet References Cited section.

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contributed to the postponement indefinitely of the reopening of the Mountain Pass Mine. The mine has been idle since 1998 when Molycorp, Inc. was cited for spilling low-level, naturally occurring radioactive waste from a broken pipeline. Before its closure, the mine was the only producer of rare earths in the Nation. The company planned to reopen the mine in late 2007.

Metals

Gold.—Despite the dramatic increase in gold prices for the year, California's production continued to decline in 2005. On the basis of data obtained by the CGS from State sources, annual reports, and estimates, annual production amounted to about 2,030 kilograms (kg) (65,300 troy ounces)—down by about 38% to 40% from that of 2004. The increased gold price contributed to a lesser drop in total value of 26%. Gold value amounted to an estimated $29 million for 2005 as compared with about $40 million for 2004.

Gold processing from existing heap-leach ore piles continued at four southern California open pit mines during 2005. These included Western Goldfields Inc.'s Mesquite Mine in Imperial County, Glamis Rand Mining Co.'s Rand Mine in Kern County, Canyon Resources Corp.'s Briggs Mine in Inyo County, and Quest Capital Corp.'s and MK Resources Co.'s Castle Mountain Mine in San Bernardino County. Mining operations had ceased at all four properties.

California's leading gold producer for the year was Western Goldfield's Mesquite Mine, acquired from Newmont Mining Corp. in November 2003. Mining operations ceased in May 2001, but Western Goldfields made plans to restart open pit mining operations in late 2006 or early 2007 in an expanded area of the mine that had been permitted by Newmont in the spring of 2002. Western Goldfields also planned to re-treat the existing heaps for additional gold recovery and explore high-grade ore extensions at the mine at depth. The company estimated that the new expanded area may contain as much as 39 Mt of gold ore averaging 0.72 grams per metric ton (g/t) (0.021 troy ounces per short ton), yielding about 28,000 kg (900,000 troy ounces) of gold. Additional nonpermitted gold resources at the Mesquite Mine have been estimated to be about 31,000 kg (1 million troy ounces).

Canyon Resource Corp. started an exploratory program to determine the feasibility of restarting mining operations at the Briggs Mine in Inyo County. The company had ceased mining in April 2004. Drilling started in the fall of 2005 on two potential high-grade underground mining targets associated with the Goldtooth Fault and between the previously mined Briggs North and Goldtooth pits. Canyon Resources was also evaluating potential ore bodies adjacent to the Briggs Main and Briggs South pits that could be mined by open pit methods.

The Glamis Rand Mining Co. completed heap leaching at its Rand Gold Mine in Kern County. During the current mine's 15 years of modern-day operation, nearly 31,000 kg of gold was produced. There were no plans to reopen the mine, at which reclamation was in progress.

MK Resources Co. and Quest Capital Corp. produced a small amount of gold during the completion of heap leaching at the Castle Mountain Mine in San Bernardino County; the mine is undergoing reclamation and there were no plans to reopen it.

Sutter Gold Mining Inc. was granted a wastewater-discharge permit from the California Regional Water Quality Control Board in October for the Sutter Gold Project in Amador County. The company called it the "final major permit" needed for the project—a proposed 217-ha underground gold mine that includes the historic Lincoln Gold Mine located along California's Mother Load gold belt. The Lincoln was last mined in 1912 and had produced a total of about $2.2 million in gold during its life. The Sutter Gold Project was backed by two parent companies (U.S. Energy Corp. and Crested Corp.) that entered into a joint venture under the name of USECC. Exploration at the project site since the 1980s has indicated gold reserves of as much as 6,220 kg. USECC expected mining at the project to commence sometime in 2006.

The Idaho Maryland Mining Corp. (a subsidiary of Emgold Mining Corp.) submitted a mining permit application in October to the City of Grass Valley in Nevada County to reopen the historic Idaho Maryland Gold Mine. The mine was California's second ranked gold producer during its lifetime (1862 to 1956) with a total production of 74,600 kg (2.4 million troy ounces) valued at $70 million. The company estimated that the mine may contain another 44,000 kg (1.4 million troy ounces) of gold valued at more than $600 million (based upon a gold price of $450 dollars per troy ounce). Reopening the Idaho Maryland Mine would require the de-watering of the existing underground mine workings during a period of time (expected by the company to be less than 1 year) by pumping out about 1.89 billion liters (500 million U.S. gallons) of water. An important feature factoring into the proposed Idaho Maryland Mine project was the use of mine waste at an onsite manufacturing facility to produce ceramic products. The permitting phase of the mine reopening was expected to be complete by May 2007 with mining projected to start in late 2007. A series of meetings and workshops were to be held during 2006 to educate the public and to gain local support for the mine.

Additionally, gold was produced as a byproduct at numerous alluvial sand and gravel mines located mainly in the northern and central part of the State. California also had several small underground gold mines that mainly produce specimen gold.

Other Metals.—Silver production made up less than 1% of California's total metal production. All the silver produced in California was a byproduct of gold production. Iron ore mined in California was used in the production of portland cement and was considered an industrial mineral.

Government Legislation and Programs

State and Local Regulations

The Governor signed California Assembly Bill 574 in the fall clarifying existing industry regulations regarding the use of recycled concrete. The bill establishes a specific definition for recycled concrete, states the specific quantities of recycled material allowed in final concrete products, and sets requirements regarding consumer notification of recycled

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aggregate use. The bill was designed to reduce the amount of concrete disposed of in landfills by encouraging more widespread use of recycled concrete aggregate.

California's South Coast Air Quality Management District (AQMD) passed Rule 1157, a measure intended to limit the dust allowed from construction materials operations throughout southern California metropolitan areas in Los Angeles, Orange, Riverside, and San Bernardino Counties. The measure went into full effect in December and affects about 400 sand and gravel facilities, concrete batch plants, and asphalt plants. It included new standards for dust emissions, dust plume height restrictions, equipment dust suppressants, sweeping of paved roads, chemical stabilizers on gravel roads, and mitigation measures to reduce dust tracked onto public roadways. The new rule was intended to help the AQMD region meet a 2006 federally mandated deadline for air quality, especially with regard to particles smaller than 10 microns.

The California Geological Survey

The California Geological Survey's Mineral Land Classification Project, a mandate of the State's Surface Mining and Reclamation Act, continued to provide State and other government agencies with mineral resource maps that have proved to be of significant value in land-use planning and mineral resource conservation. As of yearend, the CGS had classified a little over one-third of the State with regard to its mineral resources. The CGS continued work on aggregate classification projects in the Palm Springs and San Bernardino areas in San Bernardino County, the Claremont-Upland area in San Bernardino and Los Angeles Counties, the North San Francisco Bay area in Marin and Napa Counties, and in San Joaquin County. The CGS also worked on updating CGS Map Sheet 52, a map that shows data on current aggregate supply and 50-year aggregate demand for 32 aggregate resource regions throughout California (Kohler, 2007§).

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TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN CALIFORNIA[1, 2]

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral		2003 Quantity	2003 Value	2004 Quantity	2004 Value	2005 Quantity	2005 Value
Boron minerals		1,150	591,000	1,210	626,000	1,150	713,000
Cement:							
Masonry		W	W	W	W	694	80,600 e
Portland		11,600	887,000 e	11,900	1,000,000 e	11,600	1,130,000 e
Clays:							
Bentonite		23	2,560	24	2,640	20	2,200
Common		1,240	19,100	1,230	20,700	1,010	16,600
Fuller's earth		W	W	197	W	189	W
Gemstones		NA	1,080	NA	1,070	NA	1,130
Gold[3]	kilograms	4,270	50,100	3,260	43,000	W	W
Sand and gravel:							
Construction		152,000	1,150,000	166,000	1,280,000	163,000	1,440,000
Industrial		1,790	50,100	1,990	55,700	2,030	60,400
Silver[3]	kilograms	957	151	801	172	269	63
Stone:							
Crushed		55,500	371,000	55,300 r, 4	364,000 r, 4	54,300	455,000
Dimension		40	9,920	42	10,200	41	10,200
Combined values of clays (kaolin), diatomite, feldspar, gypsum (crude), iron ore (usable shipped), lime magnesium compounds, perlite (crude), pumice and pumicite, pyrophyllite [crude (2003)], salt, soda ash, stone [crushed shell (2004)], talc [crude (2004)], zeolites (2004), and values indicated by symbol W		XX	308,000	XX	349,000 r	XX	332,000
Total		XX	3,440,000	XX	3,760,000 r	XX	4,240,000

eEstimated. rRevised. NA Not available. W Withheld to avoid disclosing company proprietary data. Withheld values included in "Combined value" data. XX Not applicable.

[1]Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

[2]Data are rounded to no more than three significant digits; may not add to totals shown.

[3]Recoverable content of ores, etc.

[4]Excludes certain stones; kind and value included with "Combined values" data.

TABLE 2
CALIFORNIA: CRUSHED STONE SOLD OR USED, BY KIND[1]

Kind	2004 Number of quarries	2004 Quantity (thousand metric tons)	2004 Value (thousands)	2005 Number of quarries	2005 Quantity (thousand metric tons)	2005 Value (thousands)
Limestone[2]	28 r	26,200 r	$123,000 r	25	21,700	$161,000
Dolomite	6	895	4,930	4	705	5,150
Marble	2	(3)	(3)	2	(3)	(3)
Shell	1	W	W	1	(3)	(3)
Granite	25 r	11,800 r	93,000 r	25	13,700	122,000
Traprock	35 r	12,100 r	104,000 r	45	11,600	115,000
Sandstone and quartzite	11 r	944 r	11,500 r	6	3,810	24,300
Slate	4	(3)	(3)	4	318	2,380
Volcanic cinder and scoria	7 r	167 r	1,940 r	6	176	1,810
Miscellaneous stone	29	2,890 r	22,100 r	21	2,270	22,400
Total	XX	55,300 r	364,000 r	XX	54,300	455,000

rRevised. W Withheld to avoid disclosing company proprietary data. XX Not applicable.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes limestone-dolomite reported with no distinction between the two.

[3]Withheld to avoid disclosing company proprietary data; included in "Total."

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TABLE 3
CALIFORNIA: CRUSHED STONE SOLD OR USED BY PRODUCERS
IN 2005, BY USE[1]

(Thousand metric tons and thousand dollars)

Use	Quantity	Value
Construction:		
Coarse aggregate (+1½ inch):		
Macadam	W	W
Riprap and jetty stone	864	22,900
Filter stone	103	916
Other coarse aggregates	171	1,080
Total	1,140	24,900
Coarse aggregate, graded:		
Concrete aggregate, coarse	949	12,100
Bituminous aggregate, coarse	1,150	11,800
Bituminous surface-treatment aggregate	(2)	(2)
Railroad ballast	209	2,560
Other graded coarse aggregates	813	9,160
Total	3,120	35,600
Fine aggregate (-⅜ inch):		
Stone sand, concrete	(3)	(3)
Stone sand, bituminous mix or seal	265	2,280
Screening, undesignated	84	839
Other fine aggregates	333	3,460
Total	682	6,580
Coarse and fine aggregates:		
Graded road base or subbase	4,420	42,200
Unpaved road surfacing	657	5,180
Terrazzo and exposed aggregate	41	839
Crusher run or fill or waste	846	4,580
Other coarse and fine aggregates	2,440	20,600
Total	8,400	73,400
Other construction materials[4]	1,970	28,000
Agricultural:		
Limestone	76	1,100
Poultry grit and mineral food	(5)	(5)
Other agricultural uses	125	2,720
Total	201	3,820
Chemical and metallurgical:		
Cement manufacture	9,520	43,100
Flux stone	(6)	(6)
Glass manufacture	(6)	(6)
Sulfur oxide removal	(6)	(6)
Total	10,000	46,600
Special:		
Asphalt fillers or extenders	(7)	(7)
Whiting or whiting substitute	(7)	(7)
Other miscellaneous uses and specified uses not listed	284	7,150
Unspecified:[8]		
Reported	15,700	124,000
Estimated	13,000	104,000
Total	28,400	228,000
Grand total	54,300	455,000

W Withheld to avoid disclosing company proprietary data; included with "Other coarse aggregate."
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Withheld to avoid disclosing company proprietary data; included with "Other graded coarse aggregate."
[3]Withheld to avoid disclosing company proprietary data; included with "Other fine aggregate."
[4]Includes drain fields and pipe bedding.
[5]Withheld to avoid disclosing company proprietary data; included with "Other agricultural uses."
[6]Withheld to avoid disclosing company proprietary data; included in "Total."
[7]Withheld to avoid disclosing company proprietary data; included in "Grand total."
[8]Reported and estimated production without a breakdown by end use.

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TABLE 4
CALIFORNIA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2005, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3		District 4		District 5	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Construction:										
Coarse aggregate (+1½ inch)[2]	69	1,430	47	558	W	W	W	W	W	W
Coarse aggregate, graded[3]	W	W	W	W	W	W	W	W	W	W
Fine aggregate (-⅜ inch)[4]	W	W	W	W	W	W	W	W	W	W
Coarse and fine aggregates[5]	303	3,520	W	W	1,680	15,200	W	W	W	W
Other construction materials[7]	--	--	--	--	276	2,960	330	5,110	63	621
Agricultural[8]	--	--	W	W	--	--	--	--	W	W
Chemical and metallurgical[9]	W	W	W	W	--	--	--	--	W	W
Special[10]	--	--	--	--	--	--	--	--	--	--
Other miscellaneous uses	--	--	--	--	--	--	--	--	--	--
Unspecified:[11]										
Reported	244	2,000	22	147	--	--	486	3,480	5	39
Estimated	100	821	238	2,000	1,000	8,200	231	1,900	1,200	9,800
Total	737	7,960	1,920	16,100	4,060	42,700	2,830	29,900	1,680	14,700

	District 6		District 7		District 8		District 9		District 10	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Construction:										
Coarse aggregate (+1½ inch)[2]	--	--	W	W	W	W	W	W	W	W
Coarse aggregate, graded[3]	W	W	W	W	--	--	1,760	13,900	W	W
Fine aggregate (-⅜ inch)[4]	--	--	W	W	--	--	W	W	W	W
Coarse and fine aggregates[5]	W	W	W	W	W	W	2,150	15,800	W	W
Other construction materials[7]	--	--	1,020	15,200	--	--	272	4,050	--	--
Agricultural[8]	W	W	W	W	--	--	W	W	W	W
Chemical and metallurgical[9]	--	--	W	W	W	W	5,620	16,000	W	W
Special[10]	--	--	W	W	--	--	--	--	--	--
Other miscellaneous uses	122	4,990	--	--	--	--	161	2,160	--	--
Unspecified:[11]										
Reported	1,230	10,100	5,610	45,900	448	3,660	3,540	26,600	514	4,200
Estimated	314	2,600	137	1,100	1,100	9,300	7,800	64,000	--	--
Total	2,700	25,900	8,820	76,000	3,640	29,100	20,900	146,000	1,630	18,600

	District 11		District 12		Unspecified districts	
	Quantity	Value	Quantity	Value	Quantity	Value
Construction:						
Coarse aggregate (+1½ inch)[2]	W	W	--	--	--	--
Coarse aggregate, graded[3]	W	W	--	--	--	--
Fine aggregate (-⅜ inch)[4]	--	--	--	--	--	--
Coarse and fine aggregates[5]	W	W	(6)	(6)	--	--
Other construction materials[7]	--	--	--	--	--	--
Agricultural[8]	--	--	--	--	--	--
Chemical and metallurgical[9]	--	--	--	--	--	--
Special[10]	--	--	--	--	--	--
Other miscellaneous uses	--	--	--	--	--	--
Unspecified:[11]						
Reported	958	6,330	2,880	23,900	43	284
Estimated	220	1,800	384	3,100	--	--
Total	2,110	20,200	3,260	27,000	43	284

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes filter stone, macadam, riprap and jetty stone, and other coarse aggregate.

[3]Includes bituminous aggregate (coarse), bituminous surface-treatment aggregate, concrete aggregate (coarse), railroad ballast, and other graded coarse aggregate.

[4]Includes screening (undesignated), stone sand (concrete), stone sand bituminous mix or seal, and other fine aggregate.

[5]Includes crusher run or fill or waste, graded road base or subbase, terrazzo and exposed aggregate, unpaved road surfacing, and other coarse and fine aggregates.

[6]Withheld to avoid disclosing company proprietary data; included with "Unspecified: Reported."

[7]Includes drain fields and pipe bedding.

[8]Includes agricultural limestone, poultry grit and mineral food, and other agricultural uses.

[9]Includes cement and glass manufacture, flux stone, and sulfur oxide removal.

[10]Includes asphalt fillers or extenders and whiting or whiting substitute.

[11]Reported and estimated production without a breakdown by end use.

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TABLE 5
CALIFORNIA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2005,
BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	48,400	$450,000	$9.29
Plaster and gunite sands	7,250	87,600	12.07
Concrete products (blocks, bricks, pipe, decorative, etc.)	708	14,800	20.93
Asphaltic concrete aggregates and other bituminous mixtures	18,500	184,000	9.92
Road base and coverings	17,100	147,000	8.61
Road and other stabilization (cement and lime)	115	796	6.92
Fill	9,430	63,400	6.72
Snow and ice control	368	1,180	3.20
Other miscellaneous uses[2]	734	9,250	12.60
Unspecified:[3]			
Reported	39,900	314,000	7.88
Estimated	20,600	171,000	8.27
Total or average	163,000	1,440,000	8.84

[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.
[2]Includes railroad ballast and filtration.
[3]Reported and estimated production without a breakdown by end use.

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TABLE 6

CALIFORNIA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2005, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products	156	1,740	475	4,440	W	W
Plaster and gunite sands	W	W	--	--	--	--
Asphaltic concrete aggregates and road base materials[2]	258	1,170	1,330	12,700	W	W
Fill	2	19	6	33	68	371
Other miscellaneous uses[3]	(5)	(5)	49	379	132	1,340
Unspecified:[4]						
Reported	284	2,080	61	635	465	5,130
Estimated	897	7,420	596	4,930	172	1,420
Total	1,600	12,400	2,520	23,200	838	8,260
	District 4		District 5		District 6	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products	8,410	78,100	W	W	W	W
Plaster and gunite sands	3,910	43,500	W	W	--	--
Asphaltic concrete aggregates and road base materials[2]	12,700	120,000	1,000	8,510	W	W
Fill	934	6,060	322	2,650	1,260	14,000
Other miscellaneous uses[3]	310	2,670	484	4,180	4,220	49,500
Unspecified:[4]						
Reported	7,920	64,400	--	--	5,600	61,300
Estimated	803	6,640	1,290	10,700	1,270	10,500
Total	35,000	322,000	3,100	26,000	12,300	135,000
	District 7		District 8		District 9	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products	694	5,650	6,040	52,800	15,600	138,000
Plaster and gunite sands	W	W	232	3,200	2,190	29,100
Asphaltic concrete aggregates and road base materials[2]	W	W	3,020	29,000	8,680	70,500
Fill	343	1,850	695	7,250	1,630	6,110
Other miscellaneous uses[3]	272	4,240	111	3,090	25	136
Unspecified:[4]						
Reported	259	1,860	4,030	29,400	12,500	95,900
Estimated	226	1,870	3,120	25,800	6,670	55,100
Total	1,800	15,500	17,200	151,000	47,200	395,000
	District 10		District 11		District 12	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products	W	W	13,900	136,000	1,360	17,900
Plaster and gunite sands	W	W	717	8,600	--	--
Asphaltic concrete aggregates and road base materials[2]	172	917	4,430	45,900	1,620	15,700
Fill	177	1,460	2,820	16,700	1,180	6,910
Other miscellaneous uses[3]	445	3,100	268	460	96	897
Unspecified:[4]						
Reported	1,450	10,400	4,900	31,500	882	7,290
Estimated	2,140	17,700	2,150	17,800	1,310	10,800
Total	4,380	33,600	29,200	257,000	6,440	59,600
	Unspecified districts					
	Quantity	Value				
Concrete aggregate and concrete products	--	--				
Plaster and gunite sands	--	--				
Asphaltic concrete aggregates and road base materials[2]	--	--				
Fill	--	--				
Other miscellaneous uses[3]	--	--				
Unspecified:[4]						
Reported	1,570	4,290				
Estimated	--	--				
Total	1,570	4,290				

W Withheld to avoid disclosing company proprietary data; included in "Other miscellaneous uses." -- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes road and other stabilization (cement and lime).

[3]Includes filtration, railroad ballast, and snow and ice control.

[4]Reported and estimated production without a breakdown by end use.

[5]Less than ½ unit.

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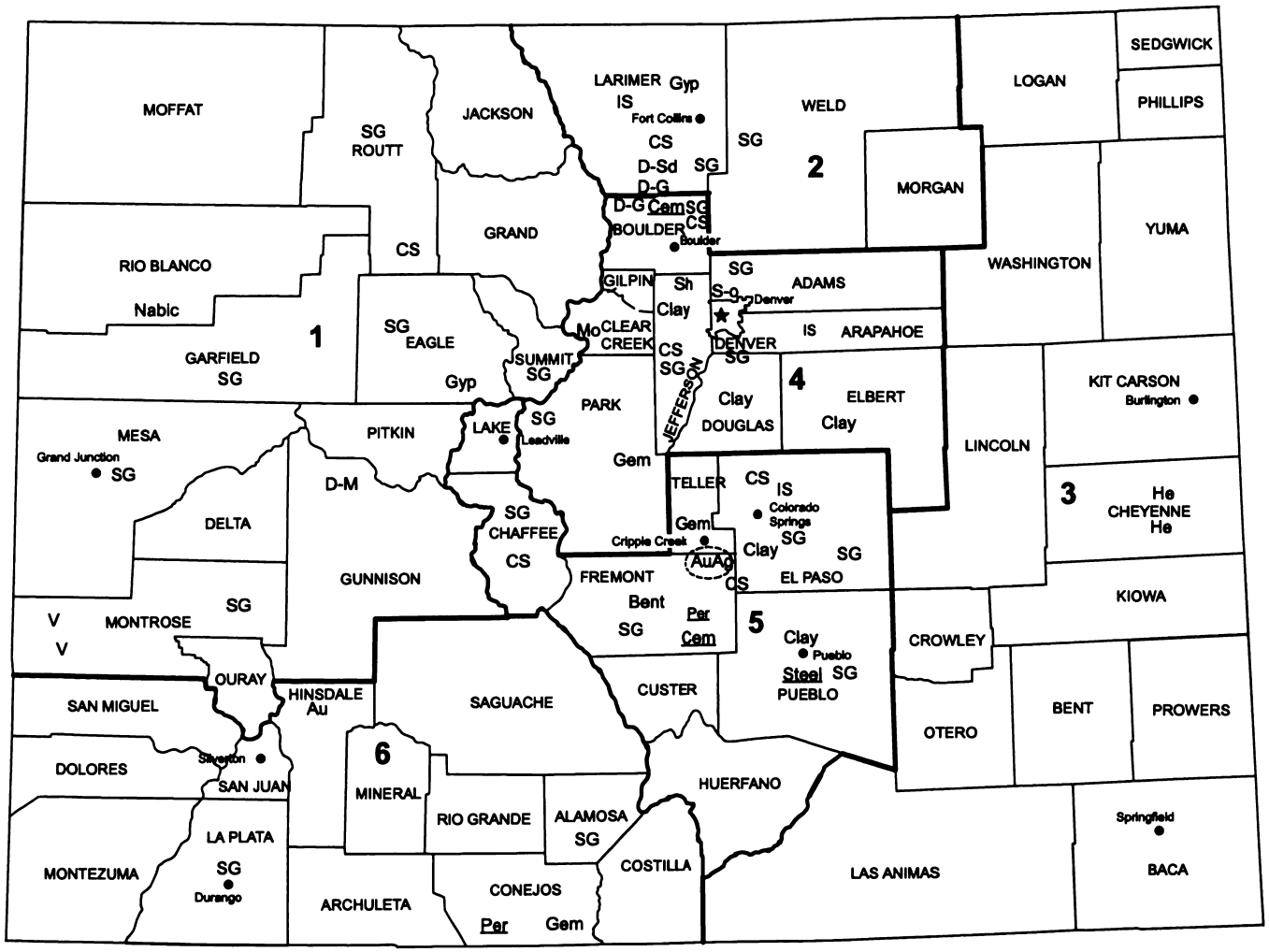
COLORADO



LEGEND

- County boundary
- Capital
- City
- 1 Crushed stone/sand and gravel districts

MINERAL SYMBOLS (Major producing areas)

Ag	Silver
Au	Gold
Bent	Bentonite
Cem	Cement plant
Clay	Common clay
CS	Crushed stone
D-G	Dimension granite
D-M	Dimension marble
D-Sd	Dimension sandstone
Gem	Gemstones
Gyp	Gypsum
He	Helium
IS	Industrial sand
Mo	Molybdenum
Nabic	Sodium bicarbonate
Per	Perlite plant
S-o	Sulfur (oil)
SG	Construction sand and gravel
Sh	Shale
Steel	Steel plant
V	Vanadium
	Concentration of mineral operations

Source: Colorado Geological Survey/U.S. Geological Survey (2005)

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THE MINERAL INDUSTRY OF COLORADO

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Colorado Geological Survey for collecting information on all nonfuel minerals.

In 2005, Colorado's nonfuel raw mineral production was valued[1] at $1.75 billion, based upon annual U.S. Geological Survey (USGS) data. This was a $740 million, or 73%, increase from the State's total nonfuel mineral production value of 2004, following a 50% increase from 2003 to 2004. Colorado rose to 10th from 17th in rank among the 50 States in nonfuel mineral production value, while accounting for nearly 3.2% of the U.S. total in 2005.

The State's two leading nonfuel mineral commodities in 2005, by value, were molybdenum concentrates and construction sand and gravel, followed by cement (portland and masonry), gold, and crushed stone. These five commodities accounted for about 98% of Colorado's total nonfuel raw mineral production value. As was the case in 2004, the largest portion of Colorado's substantial increase in value resulted from the increased production and value of molybdenum concentrates. With a significant increase in the commodity's unit value, a substantial increase in production led to a more than $600 million increase in its value in 2005. Construction sand and gravel had an increase in value of $45 million (production up by more than 9%), cement (all data withheld—company proprietary data), crushed stone had an increase in value of nearly 31%, and gold had an increase in value of more than 22%. The unit values of all these mineral commodities were up significantly. A 17% increase in the production of crushed stone resulted in a $21 million increase, up nearly 31%, in the commodity's value (table 1). The only substantial decrease was in the value of soda ash, the commercial production of which ceased during 2004. Following the 2004 sale of the soda ash operation, a restructuring of the company and its production objectives resulted in a change to different chemical products being produced there.

Approximately 65% of Colorado's nonfuel mineral production value in 2005 resulted from the production of metals—molybdenum concentrates, gold, and silver—in descending order of value; this was a significant increase from 52% in 2004, 30% in 2003, and 23% in 2002. As molybdenum concentrate production significantly increased (up more than 50%) during this time period, its total production value was more than 12 times that of 2002 as the significant growth in molybdenum concentrate prices that began in December 2002 continued on throughout 2005.

Copper prices and molybdenum concentrate prices markedly rose in 2003 and 2004, but the trend toward the recent substantial heights in molybdenum concentrate prices that began in June 2002 continued on throughout 2003 and 2004, and peaked in 2005. For example, as reported in Platts Metals Week (there in dollars per pound of contained molybdenum) the annual average price of molybdic oxide rose from $8.27 per kilogram (kg) in 2002 to $11.75 per kg in 2003 to $36.73 per kg in 2004 and nearly doubled to $70.10 per kg in 2005. In June 2005, the monthly average molybdic oxide price reached its highest point of the 4-year run at $82.54, and then followed a generally downward trend the rest of the year to close at $61.84 in December. Molybdenum concentrate prices had stayed relatively level during the early months of 2006.

In 2005, Colorado continued to be second in the quantity of molybdenum in concentrates produced among six producing States and was fourth of 11 gold-producing States. The State rose to 9th from 10th in construction sand and gravel and decreased to 10th from 9th in gemstones and to 12th from 9th in gypsum. Additionally, Colorado produced significant quantities of portland cement, crushed stone, and common clays.

The following narrative information was provided by the Colorado Geological Survey[2] (CGS) and much of the data are based on its own surveys, estimates, and information gathered from company annual reports.

Exploration and Development Activities

Copper.—Constellation Copper Corporation, Lakewood, explored further the Cashin deposit in Montrose County. According to Constellation Copper, the deposit, a sandstone-hosted copper prospect near the Colorado-Utah border, contains an estimated 5.2 million metric tons (Mt) of probable ore reserves grading 0.547% copper. Should Cashin be developed into a producing copper mine, Constellation planned to operate the mine as a satellite operation to the company's Lisbon Valley Mine, about 24 kilometers to the southwest in San Juan County, Utah (Constellation Copper Corporation, 2006§[3]).

Gold.—Wits Basin Precious Minerals Inc., Minneapolis, MN, continued exploration and development work on the Bates-Hunter Mine in Central City, Gilpin County. In late 2005, the company announced the recovery of several promising ore samples, including one that assayed 205 grams (6.6 ounces) per metric ton gold. Sampling was conducted using channel, grab, and muck-pile procedures on four different levels of the mine, ranging from the surface to the 50-meter level.

Consolidated Global Minerals Ltd., Vancouver, British Columbia, Canada (through its Colorado subsidiary Mount Royale Ventures, LLC) continued development and testing work at its Front Range Gold Project in the Gold Hill District

[1]The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2005 USGS mineral production data published in this chapter are those available as of December 2006. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—can be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

[2]James A. Cappa, Geologist and Chief, James Burnell, Geologist, and Beth Widman, Geologist, Mineral Resources and Mapping, Colorado Geological Survey, authored the text of the State mineral industry information provided by that agency.

[3]A reference that includes a section mark (§) is found in the Internet Reference Cited section.

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west of Boulder. Mine development work was focused on the Cash Mine. About 150 meters of new drift was completed and previously mined areas along the Cash and Freiberg veins were accessed. Stopes were developed and existing drifts were enlarged and improved to accommodate modern mining equipment.

Commodity Review

Industrial Minerals

Cement.—Holcim (US) Inc. operated the Portland Plant near Florence where it employed about 180 people and accounted for nearly 80% of the State's cement production. Limestone from the Fort Hays Member of the Niobrara Formation was the principal raw ingredient for Holcim's cement product. CEMEX, Inc., Houston, TX, operated a cement plant near Lyons. CEMEX employed about 100 people at its plant.

GCC-Rio Grande, Inc., El Paso, TX (a subsidiary of Mexico's Grupo Cementos de Chihuahua) continued the planning and permitting process for development of a new cement plant at Pueblo. Construction of the plant and associated mining facilities was begun in mid-2005.

Clay and Shale.—Colorado clay mines produced an estimated 300,000 metric tons (t) of common clay in 2005, representing a 19% increase compared with that produced in 2004. The clay was mined primarily in eastern Colorado, especially near the Front Range in Douglas, Elbert, El Paso, Fremont, Jefferson, and Pueblo Counties. Texas Industries Inc. (TXI), Dallas, TX, mined the Pierre Shale deposit in northern Jefferson County, producing a material for use as lightweight aggregate. This low-density, popcorn-like aggregate is produced when the raw shale is expanded under kiln-fired conditions. TXI employed about 40 people at its mine and processing facilities, mining 370,000 t of shale to yield 283,000 cubic meters of lightweight aggregate.

Crushed Stone and Sand and Gravel.—Production of aggregates in 2005 was estimated to be 57 Mt, 78% of which was sand and gravel. The total value of aggregates was $370 million, up 22% from that of 2004 (table 1). Production of industrial sand and gravel was estimated to be more than 63,500 t based upon average production values for the years 2003 and 2004. Colorado's leading producer of industrial sand and gravel was O-N Minerals, Cleveland, OH.

Dimension Stone.—Production of dimension stone increased by 3.8% in 2005 compared with revised production estimates for 2004. The principal Colorado dimension stones include granite, marble, rhyolite, and sandstone. Colorado Stone Quarries (a subsidiary of Polycor, Inc., Quebec, Canada) produced about 4,630 t of stone at its Yule Marble quarry near Marble, an increase of about 40% compared with that of 2004. The majority of Yule marble is now being made into slab and tile for international sales, although some is still used for sculpting. Colorado Quarries Inc., Canon City, produced about 45,600 t of decorative, precast, and landscape stone from several operating quarries. Arkins Park Stone Corporation produced an estimated 7,260 t of buff (light pinkish-brown) sandstone as well as "Berthoud Pink" and "Berthoud Sunset" sandstone from the Permian Lyons Sandstone. Arkins Park operated three quarries near the town of Masonville using about 40 employees.

Gypsum.—American Gypsum Co., the principal miner of gypsum in the State, produced 577,000 t of gypsum at its mine and wallboard plant, near Gypsum, representing a 2.6% increase in production compared with that of 2004. During the year, the company began the process of developing a new mining area northeast of the current site. It was anticipated that mining would gradually shift to the new site as reserves were depleted at the original site. Most gypsum production goes towards the manufacture of wallboard and plaster products; however, gypsum is also used as a cement ingredient, as a soil conditioner, and in other industrial uses such as glassmaking and smelting. Colorado Lien (a subsidiary of Pete Lien & Sons, Inc., Rapid City, SD) and a few other small operations produce gypsum for cement or soil conditioners. Colorado Lien produces about 45,400 metric tons per year (t/yr) of gypsum from its Munroe Quarry north of Fort Collins near Livermore.

Helium.—Grade-A helium is produced at Duke Energy Field Service's Ladder Creek natural gas processing plant near Cheyenne Wells in eastern Colorado. The helium is liquefied at minus 458° F to separate it from the natural gas produced in the process. The Ladder Creek plant produced 2.7 million cubic meters of Grade-A helium from local sources in 2005.

Soda Ash.—Natural Soda, Inc., Rio Blanco County, recovered naturally occurring sodium bicarbonate from nahcolite at its U.S. Bureau of Land Management leases in the Piceance Basin in northwest Colorado. In 2005, Natural Soda Inc. produced 76,500 t of sodium bicarbonate, from its solution mine and recovery plant, a 6% increase compared with that of 2004. Both food-grade (baking soda) and industrial-grade sodium bicarbonate products were produced at the plant. The facility has a sodium bicarbonate production capacity of about 100,000 t/yr.

Metals

Gold and Silver.—The Cripple Creek & Victor Gold Mining Company (CC&V), a joint venture between AngloGold Ashanti Ltd. of South Africa and Golden Cycle Gold Corporation of Colorado Springs, produced 10,250 kilograms (kg) of gold in 2005. The quantity of gold recovered from the Teller County mine was up slightly from that of 2004. The company's stated ore reserves were 121.8 Mt having an average grade of 0.617 grams per metric ton (g/t) gold at yearend. These reserves were considered sufficient to keep the mine operating until at least 2013.

Silver was recovered as a byproduct of CC&V's gold mining activities in Teller County. Approximately 5,260 kg of silver was produced in 2005.

LKA International, Inc., Gig Harbor, WA, announced production of 794.5 kg of gold in 2005 from its Golden Wonder Mine, Hinsdale County. The Golden Wonder Mine is a small but high-grade underground gold mine near Lake City in the San Juan Mountains. In 2005, production increased by 78% compared with that of 2004 as the average grade of ore mined increased by 73% to 677 g/t gold (LKA International, Inc., 2006). Further development of the mine during the year had

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resulted in the intersection of a significantly higher grade of ore at a level below the existing area being mined (LKA International, Inc., 2005).

Molybdenum.—All of Colorado's molybdenum production was generated from the Henderson Mine in Clear Creek County. The mine, located in the Front Range west of Idaho Springs, is North America's leading primary producer of molybdenum. This large, underground block-cave mine is owned by Climax Molybdenum Company (a subsidiary of Phelps Dodge Corp., Phoenix, AZ). Production of molybdenum metal in 2005 was 15,100 t, a 19% increase compared with that produced in 2004. The estimated gross value of this production was $1,020 million, an increase of 158% compared with that of 2004. Climax continued to benefit from the increase in the price of molybdenum metal, peaking in 2005 at nearly five times its 2003 average price of $17.64 per kilogram ($8 per pound). The company added 157 people to its workforce at the mine and mill complex during the year, raising it to a level of about 560.

The Climax Mine, also owned by Phelps Dodge, was the first major molybdenum mine in the United States. It is located on the Continental Divide at Fremont Pass between Leadville and Copper Mountain in Lake and Summit Counties. The mine has been on care-and-maintenance status since 1995. Phelps Dodge reported that the Climax deposit contains proven millable reserves of 140 Mt of ore grading 0.19% molybdenum. The significant increase in the price for molybdenum since 2003 prompted the company to begin to evaluate the feasibility of restarting the mine.

Vanadium.—Colorado was the only State to produce vanadium ore in 2005. Vanadium was a coproduct of uranium production from mines operated by Cotter Corporation in Montrose County. Cotter had opened four mines in the Colorado Plateau area of western Colorado during the period 2002 to 2005. However, economic factors forced the company to close all of these mines in November 2005. Although these mines were known mainly as a source of uranium, production of vanadium exceeded production of uranium, both in quantity and value. In 2005, Cotter's four mines produced 41,400 t of ore containing about 623,000 kg of vanadium measured as vanadium pentoxide.

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LKA International, Inc., 2006, LKA releases highlights of 2005 year-end financial results: LKA International, Inc. press release, April 19, 2 p.

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TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN COLORADO[1, 2]

(Thousand metric tons and thousand dollars)

Mineral	2003		2004		2005	
	Quantity	Value	Quantity	Value	Quantity	Value
Clays:						
Bentonite	W	W	5	W	3	W
Common	259	1,580	249	1,510	255	1,610
Gemstones	NA	281	NA	360	NA	358
Lime	26	2,330	26	2,570	29	3,900
Sand and gravel:						
Construction	37,500	213,000	40,900	235,000	44,700	280,000
Industrial	70	W	W	3,300	W	W
Stone:						
Crushed	10,400	64,000	11,100 r	68,300 r	13,000	89,100
Dimension	5	1,610	16	1,980	18	2,400
Combined values of cement, gold, gypsum (crude), helium (Grade-A), molybdenum concentrates, silver, soda ash (2003-04), and values indicated by symbol W	XX	391,000	XX	699,000	XX	1,380,000
Total	XX	673,000	XX	1,010,000 r	XX	1,750,000

rRevised. NA Not available. W Withheld to avoid disclosing company proprietary data. Withheld values included in "Combined value" data.
XX Not applicable.

[1]Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

[2]Data are rounded to no more than three significant digits; may not add to totals shown.

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TABLE 2
COLORADO: CRUSHED STONE SOLD OR USED, BY KIND[1]

Kind	2004 Number of quarries	2004 Quantity (thousand metric tons)	2004 Value (thousands)	2005 Number of quarries	2005 Quantity (thousand metric tons)	2005 Value (thousands)
Limestone	6	1,800	$10,800	6	1,540	$11,300
Dolomite	1	W	W	1	42	290
Marble	1	W	W	1	W	W
Granite	9	5,230	33,900	10	6,240	42,400
Traprock	--	--	--	1	W	W
Sandstone and quartzite	5	3,210	18,400	7	4,430	30,400
Volcanic cinder and scoria	3	159	1,010	3	159	1,080
Miscellaneous stone	10 r	W	W	7	583	3,590
Total	XX	11,100 r	68,300 r	XX	13,000	89,100

rRevised. W Withheld to avoid disclosing company proprietary data; included in "Total." XX Not applicable.
-- Zero.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.

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TABLE 3
COLORADO: CRUSHED STONE SOLD OR USED BY PRODUCERS
IN 2005, BY USE[1]

(Thousand metric tons and thousand dollars)

Use	Quantity	Value
Construction:		
Coarse aggregate (+1½ inch):		
Riprap and jetty stone	579	4,760
Filter stone	W	W
Other coarse aggregate	211	1,620
Total	790	6,380
Coarse aggregate, graded:		
Concrete aggregate, coarse	(2)	(2)
Bituminous aggregate, coarse	945	7,530
Bituminous surface-treatment aggregate	(2)	(2)
Railroad ballast	(2)	(2)
Other graded coarse aggregate	1	3
Total	1,970	17,000
Fine aggregate (-⅜ inch):		
Stone sand, concrete	494	1,200
Stone sand, bituminous mix or seal	858	2,920
Screening, undesignated	(3)	(3)
Other fine aggregate	14	57
Total	1,370	4,180
Coarse and fine aggregates:		
Graded road base or subbase	351	1,550
Unpaved road surfacing	(4)	(4)
Crusher run or fill or waste	257	1,910
Other coarse and fine aggregates	30	215
Total	638	3,670
Agricultural, limestone	(5)	(5)
Chemical and metallurgical, sulfur oxide removal	(6)	(6)
Special, mine dusting or acid water treatment	(6)	(6)
Unspecified:[7]		
Reported	4,030	27,600
Estimated	4,100	28,000
Total	8,170	56,000
Grand total	13,000	89,100

W Withheld to avoid disclosing company proprietary data; included with "Other coarse aggregate."
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Withheld to avoid disclosing company proprietary data; included in "Total."
[3]Withheld to avoid disclosing company proprietary data; included with "Other fine aggregate."
[4]Withheld to avoid disclosing company proprietary data; included with "Other coarse and fine aggregates."
[5]Withheld to avoid disclosing company proprietary data; included with "Unspecified: Reported."
[6]Withheld to avoid disclosing company proprietary data; included in "Grand total."
[7]Reported and estimated production without a breakdown by end use.

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TABLE 4

COLORADO: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2005, BY USE AND DISTRICT[1, 2]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 4	
	Quantity	Value	Quantity	Value	Quantity	Value
Construction:						
Coarse aggregate (+1½ inch)[3]	W	W	--	--	W	W
Coarse aggregate, graded[4]	--	--	--	--	W	W
Fine aggregate (-⅜ inch)[5]	W	W	--	--	W	W
Coarse and fine aggregates[6]	W	W	--	--	W	W
Agricultural[7]	--	--	--	--	--	--
Chemical and metallurgical[8]	W	W	--	--	--	--
Special[9]	W	W	--	--	--	--
Unspecified:[10]						
Reported	--	--	--	--	3,950	27,100
Estimated	309	2,100	358	2,500	3,100	21,000
Total	427	3,470	358	2,460	9,140	63,200

	District 5		District 6		Unspecified districts	
	Quantity	Value	Quantity	Value	Quantity	Value
Construction:						
Coarse aggregate (+1½ inch)[3]	W	W	--	--	--	--
Coarse aggregate, graded[4]	W	W	--	--	--	--
Fine aggregate (-⅜ inch)[5]	612	1,510	--	--	--	--
Coarse and fine aggregates[6]	W	W	42	210	--	--
Agricultural[7]	W	W	--	--	--	--
Chemical and metallurgical[8]	--	--	--	--	--	--
Special[9]	W	W	--	--	--	--
Unspecified:[10]						
Reported	--	--	20	124	57	343
Estimated	383	2,600	--	--	--	--
Total	2,960	19,300	62	334	57	343

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]No production for District 3.

[3]Includes filter stone, riprap and jetty stone, and other coarse aggregates.

[4]Includes bituminous aggregate (coarse), bituminous surface-treatment aggregate, concrete aggregate (coarse), railroad ballast, and other graded coarse aggregate.

[5]Includes stone sand (bituminous mix or seal), stone sand (concrete), and screening (undesignated), and other fine aggregate.

[6]Includes crusher run or fill or waste, graded road base or subbase, unpaved road surfacing, and other coarse and fine aggregates.

[7]Includes limestone.

[8]Includes sulfur oxide removal.

[9]Includes mine dusting or acid water treatment.

[10]Reported and estimated production without a breakdown by end use.

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TABLE 5
COLORADO: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2005,
BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	6,660	$51,600	$7.75
Plaster and gunite sands	49	444	9.10
Concrete products (blocks, bricks, pipe, decorative, etc.)	67	499	7.43
Asphaltic concrete aggregates and other bituminous mixtures	2,320	21,100	9.08
Road base and coverings[2]	7,590	41,000	5.40
Fill	1,330	5,610	4.23
Snow and ice control	70	881	12.52
Other miscellaneous uses[3]	413	3,330	8.06
Unspecified:[4]			
Reported	12,600	73,100	5.80
Estimated	13,600	82,400	6.04
Total or average	44,700	280,000	6.26

[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.
[2]Includes road and other stabilization (cement).
[3]Includes railroad ballast and filtration.
[4]Reported and estimated production without a breakdown by end use.

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TABLE 6

COLORADO: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2005, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products[2]	1,460	14,800	1,370	9,100	283	2,990
Asphaltic concrete aggregates and other bituminous mixtures	620	7,420	W	W	W	W
Road base and coverings[3]	2,010	11,300	1,130	8,360	732	2,460
Fill	125	611	454	1,490	5	60
Snow and ice control	9	72	W	W	--	--
Other miscellaneous uses[4]	123	1,050	351	1,700	75	900
Unspecified:[5]						
Reported	365	2,050	7,310	44,400	276	1,670
Estimated	2,210	13,400	3,790	23,000	867	5,260
Total	6,930	50,700	14,400	88,100	2,240	13,300

	District 4		District 5		District 6	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products[2]	1,390	10,400	1,890	12,100	375	3,100
Asphaltic concrete aggregates and other bituminous mixtures	387	2,850	W	W	W	W
Road base and coverings[3]	308	1,120	1,130	4,060	2,290	13,600
Fill	433	2,110	90	248	218	1,090
Snow and ice control	W	W	W	W	21	206
Other miscellaneous uses[4]	171	1,430	263	1,840	788	7,830
Unspecified:[5]						
Reported	2,060	12,400	1,210	7,190	688	3,940
Estimated	4,960	29,800	1,210	7,330	599	3,630
Total	9,700	60,200	5,790	32,800	4,970	33,400

	Unspecified districts	
	Quantity	Value
Concrete aggregate and concrete products[2]	--	--
Asphaltic concrete aggregates and other bituminous mixtures	--	--
Road base and coverings[3]	--	--
Fill	--	--
Snow and ice control	--	--
Other miscellaneous uses[4]	--	--
Unspecified:[5]		
Reported	688	1,330
Estimated	--	--
Total	688	1,330

W Withheld to avoid disclosing company proprietary data; included in "Other miscellaneous uses." -- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes plaster and gunite sands.

[3]Includes road and other stabilization (cement).

[4]Includes filtration and railroad ballast.

[5]Reported and estimated production without a breakdown by end use.

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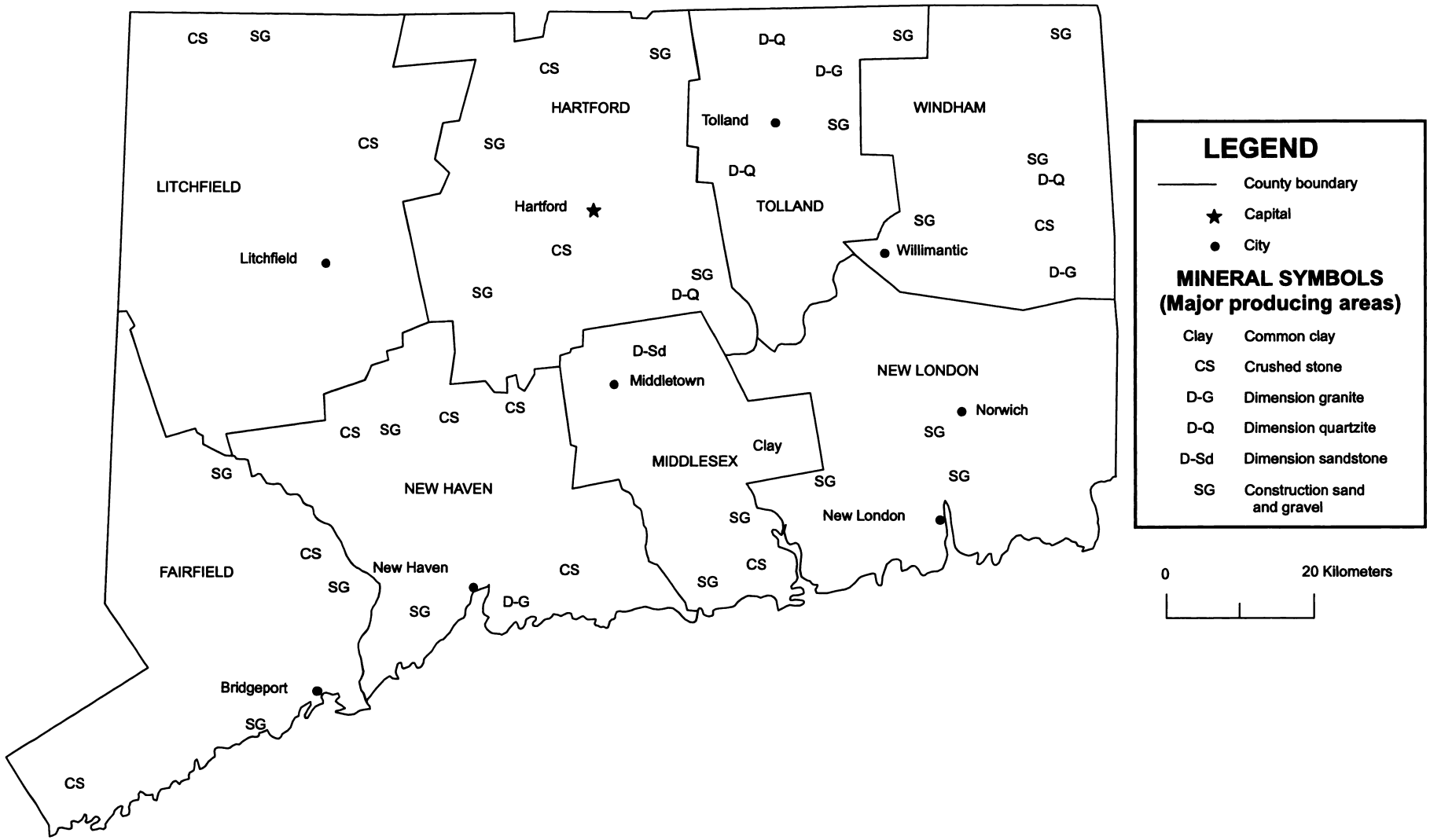
CONNECTICUT



Source: Connecticut Geological and Natural History Survey/U.S. Geological Survey (2005)

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THE MINERAL INDUSTRY OF CONNECTICUT

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Connecticut Geological and Natural History Survey for collecting information on all nonfuel minerals.

In 2005, Connecticut's nonfuel raw mineral production was valued[1] at about $157 million, based upon annual U.S. Geological Survey (USGS) data. This was a nearly 20% increase compared with that of 2004 and followed a 1.5% decrease from 2003 to 2004. Because data for dimension stone (mostly quartzite) and common clays (2004-05) were withheld (company proprietary data), the actual total values for 2003-05 are higher than those reported in table 1.

Crushed stone and construction sand and gravel, the leading nonfuel mineral commodities by value, accounted for nearly all the State's total nonfuel mineral production and value. In 2005, significant increases in the values of both nonfuel minerals led to the State's significant rise in value for the year. The value of crushed stone rose 22%, or $16.9 million, in 2005, although production remained the same as in 2004. Similarly, a relatively small increase in construction sand and gravel production led to a more than 15%, or $8.6 million, rise in the commodity's value. The value of common clay also was up, slightly, while the production and value of dimension stone and gemstones remained the same (table 1).

[1]The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2005 USGS mineral production data published in this chapter are those available as of December 2006. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—can be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN CONNECTICUT[1, 2]

(Thousand metric tons and thousand dollars)

Mineral	2003		2004		2005	
	Quantity	Value	Quantity	Value	Quantity	Value
Clays, common	52	143	87	(3)	89	(3)
Gemstones	NA	6	NA	6	NA	6
Sand and gravel, construction	8,150	51,200	8,330	55,600	8,400	64,200
Stone:						
Crushed	10,400	81,800	10,100 r	75,700	10,100	92,600
Dimension	W	(3)	W	(3)	W	(3)
Total	XX	133,000	XX	131,000	XX	157,000

rRevised. NA Not available. W Withheld to avoid disclosing company proprietary data. XX Not applicable.
[1]Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2]Data are rounded to no more than three significant digits; may not add to totals shown.
[3]Value excluded to avoid disclosing company proprietary data.

TABLE 2
CONNECTICUT: CRUSHED STONE SOLD OR USED, BY KIND[1]

Kind	2004			2005		
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Number of quarries	Quantity (thousand metric tons)	Value (thousands)
Limestone[2]	4	1,100	$8,760	4	1,060	$9,780
Dolomite	2 r	W	W	2	644	6,390
Granite	6 r	287 r	2,300 r	6	382	3,470
Traprock	9	8,080	59,600	9	7,980	73,000
Miscellaneous stone	1	W	W	1	1	5
Total	XX	10,100 r	75,700	XX	10,100	92,600

rRevised. W Withheld to avoid disclosing company proprietary data; included in "Total." XX Not applicable.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes limestone-dolomite reported with no distinction between the two.

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TABLE 3

CONNECTICUT: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2005, BY USE[1]

(Thousand metric tons and thousand dollars)

Use	Quantity	Value
Construction:		
Coarse aggregate (+1½ inch):		
Riprap and jetty stone	14	99
Filter stone	W	W
Other coarse aggregates	53	673
Total	67	772
Coarse aggregate, graded:		
Concrete aggregate, coarse	(2)	(2)
Bituminous aggregate, coarse	(2)	(2)
Bituminous surface-treatment aggregate	(2)	(2)
Other graded coarse aggregates	399	5,290
Total	721	7,240
Fine aggregate (-⅜ inch):		
Stone sand, bituminous mix or seal	(2)	(2)
Screening, undesignated	(2)	(2)
Other fine aggregates	94	1,200
Total	138	1,510
Coarse and fine aggregates:		
Graded road base or subbase	287	1,850
Unpaved road surfacing	(2)	(2)
Terrazzo and exposed aggregates	(2)	(2)
Crusher run or fill or waste	(2)	(2)
Other coarse and fine aggregates	298	2,510
Total	635	4,840
Other construction materials	9	73
Unspecified:[3]		
Reported	7,610	70,000
Estimated	893	8,200
Total	8,500	78,200
Grand total	10,100	92,600

W Withheld to avoid disclosing company proprietary data; included with "Other coarse aggregate."

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Withheld to avoid disclosing company proprietary data; included in "Total."

[3]Reported and estimated production without a breakdown by end use.

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TABLE 4

CONNECTICUT: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2005,

BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	1,050	$10,200	$9.75
Concrete products (blocks, bricks, pipe, decorative, etc.)[2]	307	2,850	9.27
Asphaltic concrete aggregates and other bituminous mixtures	255	2,160	8.46
Road base and coverings	270	2,490	9.24
Fill	525	2,210	4.22
Snow and ice control	278	2,740	9.86
Other miscellaneous uses[3]	106	1,240	11.69
Unspecified:[4]			
Reported	2,840	18,900	6.66
Estimated	2,780	21,400	7.72
Total or average	8,400	64,200	7.64

[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

[2]Includes plaster and gunite sands.

[3]Includes filtration.

[4]Reported and estimated production without a breakdown by end use.

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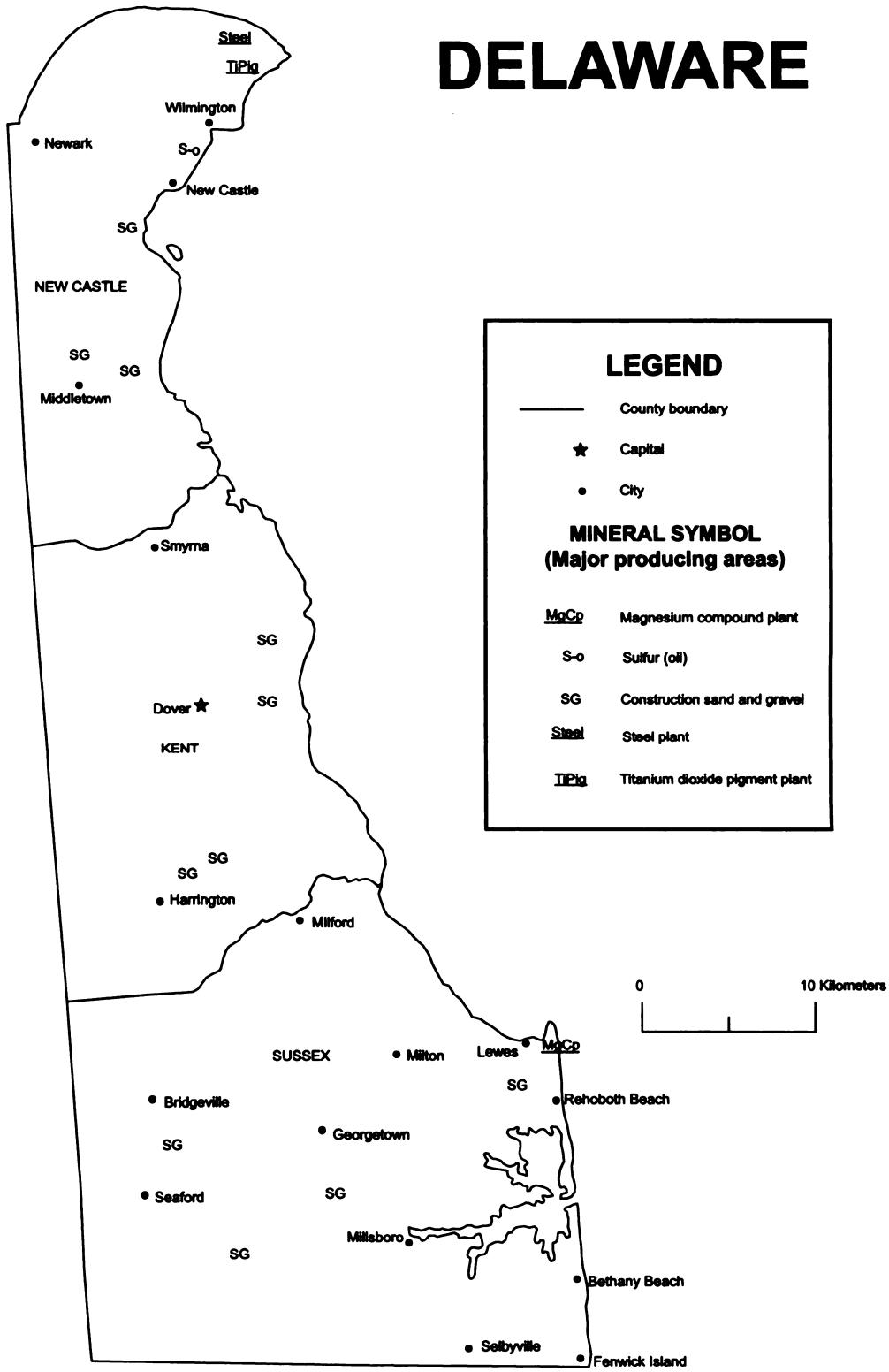
DELAWARE



Source: Delaware Geological Survey/U.S. Geological Survey (2005)

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THE MINERAL INDUSTRY OF DELAWARE

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Delaware Geological Survey for collecting information on all nonfuel minerals.

In 2005, Delaware's nonfuel raw mineral production was valued[1] at $20 million, based upon annual U.S. Geological Survey (USGS) data. This was a decrease of 8.7% from 2004, which followed a more than 22% increase from 2003 to 2004. Because production data for magnesium compounds and crushed stone (2005) were withheld (company proprietary data), the State's actual annual total values are significantly higher than those listed in table 1.

In 2005, Delaware's leading nonfuel mineral continued to be construction sand and gravel, although production, as reported to the USGS, decreased by 11% with a decrease in value of $1.9 million (table 1). With a more than 10% increase in production, the value of magnesium compounds was up slightly.

In 2005, Delaware continued to rank fourth of five States in the quantities of magnesium compounds produced. Magnesium compounds, extracted from seawater close to the mouth of the Delaware Bay, near Lewes, Sussex County, were used to manufacture chemical and pharmaceutical products. Crushed stone (classified as limestone for statistical purposes) from various out-of-State sources was processed through the sales yards of Tilcon Delaware, Inc. in Kent, New Castle, and Sussex Counties. The last crushed stone production reported from a Delaware quarry was to the U.S. Bureau of Mines in 1968; the State's only stone producer ceased operations in New Castle County near Wilmington at the end of 1968 (Gustavson, 1971, p. 204). Gabbro (classified as granite for statistical purposes) was quarried and then crushed and sized as a concrete aggregate or as stone sand, while a small quantity was sold as riprap. During the previous several years, the State's crushed stone needs progressively had been fulfilled by purchases of stone from sources in Maryland and Pennsylvania (Gustavson, 1970, p. 196). All gemstones production was from that of hobbyists.

The narrative information that follows was provided by the Delaware Geological Survey[2] (DGS). According to the DGS, there were at least 11 major sand and gravel production operations in Delaware. General locations are shown on the map on the facing page and on the DGS Web site at http://www.udel.edu/dgs/Minres/sandmap.html. The DGS estimates that the quantities of sand and gravel produced from the State's natural resources are typically higher than those reported by the USGS (table 1). Reasons for this may include (1) not all major producers report production to the USGS, (2) government agencies or companies that produce from pits for their own use do not necessarily report production, (3) many operations that mine relatively small amounts of sand and gravel may not have been contacted and, therefore, do not report production, and (4) production of sand from offshore areas for beach replenishment is not included in USGS figures. For example, according to the Delaware Department of Natural Resources and Environmental Control, in 2004 and 2005, approximately 4 million metric tons (about 2.7 million cubic meters) of sand with an estimated value of $20.3 million was dredged from the Delaware Bay and the Atlantic Ocean offshore Delaware and placed on beaches along the Atlantic Coast and Delaware Bay. During 2005, the DGS continued work to further evaluate sand resources offshore.

Government Programs and Activities

The U.S. Department of the Interior's Minerals Management Service (MMS) continued to provide support for studies to characterize offshore sand resources in both State and Federal waters for possible use for beach replenishment. Through 2005, the DGS had identified 16 areas offshore Delaware (covering more than 28 square kilometers) to be excellent or good sand resource areas containing an estimated 140 million metric tons (80 million cubic meters) of the resource (McKenna and Ramsey, 2002§[3]). Exploration and evaluation activities continued on into 2006.

The DGS continues to operate and maintain the "DGS Atlantic Outer Continental Shelf Core and Sample Repository." Federal agencies, other State agencies, and private institutions that recognize the value of having a centralized repository contributed samples. The repository contains samples from all 51 oil and gas exploratory wells drilled on the North, Middle, and South Atlantic Outer Continental Shelf between 1977 and 1984. Samples include cores, unwashed cuttings, vials containing samples processed for micropaleontology and palynology, micropaleontology and palynology slides, and thin sections of cores and cuttings. A description of the DGS repository and a summary of holdings are on the DGS Web site (Delaware Geological Survey, 2007a§, b§). The DGS is designated as the primary repository for these samples by the MMS.

The DGS continued to be actively involved in the mineral industry in Delaware through the identification and evaluation of sand and gravel resources as part of its geologic and hydrologic mapping programs and through service on a county committee involved in evaluating and renewing applications for extractive use operations.

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[1]The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2005 USGS mineral production data published in this chapter are those available as of December 2006. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—can be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

[2]John H. Talley, Director and State Geologist, authored the text of the State mineral industry information provided by the Delaware Geological Survey.

[3]References that include a section mark (§) are found in the Internet References Cited section.

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McKenna, K.K., and Ramsey, K.W., 2002, Delaware Geological Survey Report of Investigations No. 63—An evaluation of sand resources, Atlantic offshore, Delaware, accessed December 29, 2006, at URL http://www.udel.edu/dgs/Publications/pubsonline/RI63.pdf.

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN DELAWARE[1, 2]

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral		2003		2004		2005	
		Quantity	Value	Quantity	Value	Quantity	Value
Gemstones		NA	1	NA	1	NA	1
Magnesium compounds	metric tons	W	(3)	W	(3)	W	(3)
Sand and gravel, construction		2,550	17,900	2,980	21,900	2,640	20,000
Stone, crushed		--	--	--	--	W	(3)
Total		XX	17,900	XX	21,900	XX	20,000

NA Not available. W Withheld to avoid disclosing company proprietary data. XX Not applicable. -- Zero.

[1]Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

[2]Data are rounded to no more than three significant digits; may not add to totals shown.

[3]Value excluded to avoid disclosing company proprietary data.

TABLE 2
DELAWARE: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2005, BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)[2]	966	$8,440	$8.74
Fill	386	1,560	4.03
Other miscellaneous uses[3]	32	245	7.72
Unspecified:[4]			
Reported	533	5,000	9.37
Estimated	719	4,760	6.61
Total or average	2,640	20,000	7.58

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes plaster and gunite sands and asphaltic concrete aggregates and other bituminous mixtures.

[3]Includes snow and ice control.

[4]Estimated production without a breakdown by end use.

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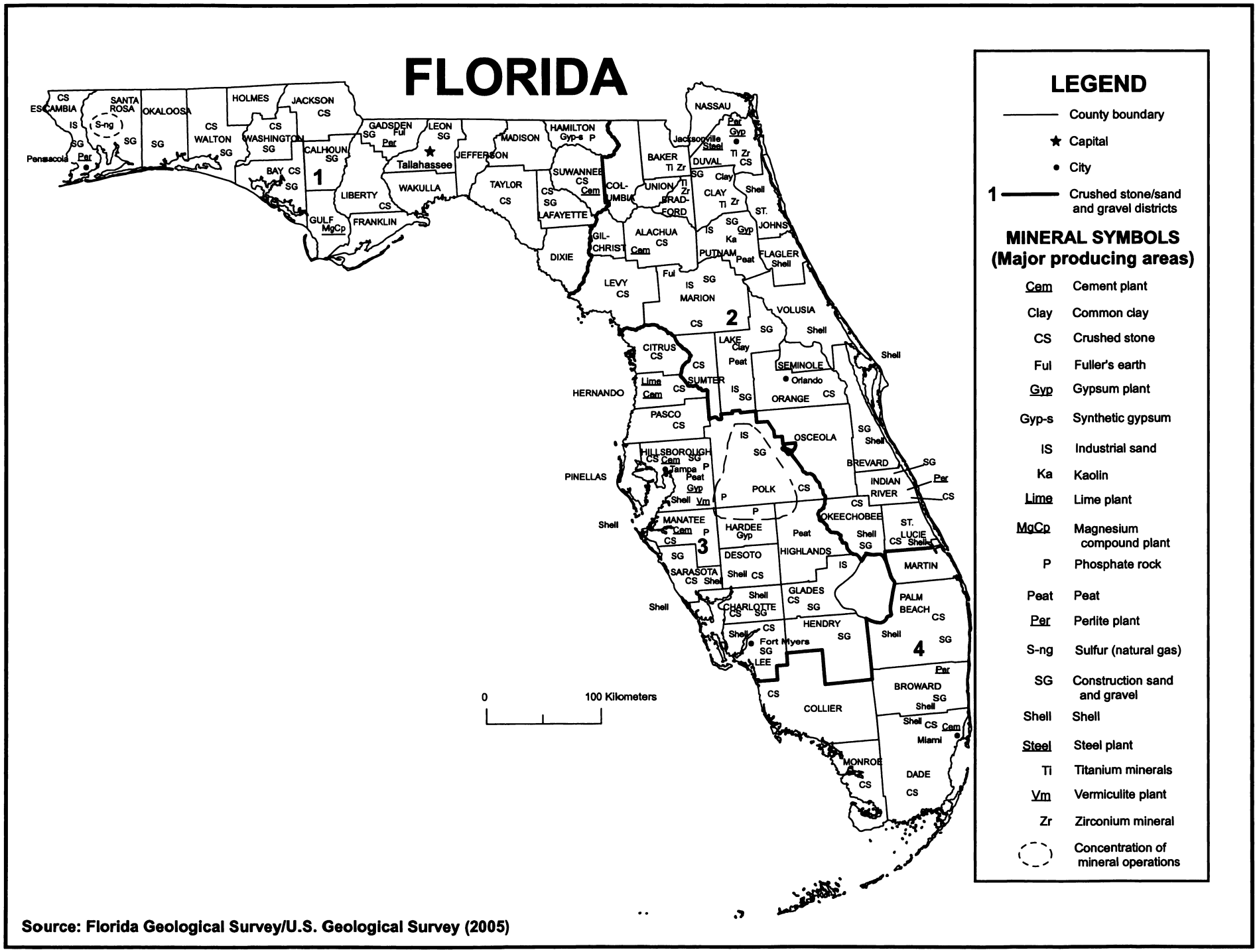

Source: Florida Geological Survey/U.S. Geological Survey (2005)

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THE MINERAL INDUSTRY OF FLORIDA

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Florida Geological Survey for collecting information on all nonfuel minerals.

In 2005, Florida's nonfuel raw mineral production was valued[1] at $2.89 billion, based upon annual U.S. Geological Survey (USGS) data. This was a $570 million or a 24.6% increase from the State's total of $2.32 billion in 2004, which was up 12.1% from that of 2003. The State remained fourth in rank among the 50 States in total nonfuel mineral production value, of which the State accounted for more than 5% of the U.S. total.

Florida continued to lead the Nation in phosphate rock mining in 2005 with about 75% of U.S. production, producing more than six times as much as the next highest producing State. Phosphate rock is produced in only four States. In terms of value, crushed stone moved ahead of phosphate rock as Florida's leading nonfuel mineral commodity, followed by phosphate rock, cement (portland and masonry), construction sand and gravel, zirconium concentrates, and titanium concentrates (ilmenite and rutile), the combined values of which represented 97% of the State's total nonfuel mineral value.

In 2005, most of Florida's mined nonfuel mineral commodities increased in value, nearly all of which also increased in unit value. The largest increases in value took place in crushed stone, cement (portland and masonry), construction sand and gravel, and phosphate rock, the unit values of each commodity showing significant increases. A 9.5% increase in crushed stone production led to a 46%, or $314 million, increase in the commodity's total value and close to 11% more cement production resulted in a more than 22%, or $118 million, increase in its value. Construction sand and gravel production rose 28%, the value of which increased by $64 million, a 44% increase. Phosphate rock, with a relatively marginal increase in production, rose by $54 million while moderately increasing in unit value. These were followed by zirconium concentrates, up $9 million, and fuller's earth and rutile, up about $6 million each. The most significant decreases in value were in magnesium compounds and ilmenite, down about $5 million and $2 million, respectively. Data on mineral production are provided in table 1.

The Florida Geological Survey[2] (FGS) provided the following narrative information. Production and other data in the following text are those reported by the FGS, based upon that agency's own surveys and estimates. The FGS data may differ from some production figures reported to the USGS.

[1]The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2005 USGS mineral production data published in this chapter are those available as of December 2006. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—can be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

[2]Steven Spencer, Professional Geologist, and James Balsillie, Coastal/Economic Geologist, authored the text of the State mineral industry information provided by the Florida Geological Survey.

Exploration and Development

Expansion of phosphate mining has been proposed in west-central Florida (Hardee and Manatee Counties), to the south in DeSoto County, and in northern Florida in Lafayette County, involving some 32,900 hectares (ha). While sand supplies were adequate, the same was not true for cement, gravel, and crushed stone. Cement and stone aggregates continued to be imported into Florida, although not in quantities exceeding Florida's production levels. Industry standard distances from the source to construction sites for the Nation commonly have an average transportation trucking range of 80 kilometers (km) (50 miles) based on economics (National Stone, Sand and Gravel Association, 2005). In Florida, more than one-half of the crushed stone aggregate comes from the southernmost part of Florida, in Dade County. The remainder of Florida is experiencing progressively larger transportation distances for delivery of stone aggregates, commonly up to 240 km (150 miles). This, in turn, owing to increasing fuel prices, is elevating aggregate costs to the consumer. In northern Florida, although precise quantities are unknown, stone aggregate is arriving by barges down the Mississippi River and by rail and ships. A shortage in qualified truck drivers is aggravating delivery accommodations. Florida is experiencing a rapid population growth and a shortage of qualified construction personnel to build housing. As aggregate production levels rise, it is anticipated that the State's reserves might be exhausted or in economic jeopardy in a relatively short time. This is partly owing to public opposition to mining and environmental concerns, preemption of mining rights because of zoning or deed restrictions, and (or) other litigation-related land-use constraints.

Florida's mineral resources reach beyond those of terrestrial origin or siting, especially for Florida's excessively broad continental margins in the Gulf of Mexico. The Florida Geological Survey's research on the State's marine waters off the Gulf of Mexico has received recognition by the U.S. Department of the Interior's Minerals Management Service (MMS). A significant number of investigations have been published or otherwise reported on concerning offshore sediments along Florida's Gulf of Mexico coastline. Balsillie and Clark (2001, p. 1) compiled a comprehensive treatment of the subject on a regional, subregional, and Florida county-by-county basis. Their study was undertaken to identify what is known about potential sources of sediment for beach restoration and maintenance renourishment. They annotated publications and reports so that the user will have a grasp of the information and area of applicability of each included work.

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Commodities Review

Industrial Minerals

In 2005, Florida continued to be the only State to process rutile (titanium concentrate) and to mine and produce staurolite. The State also remained first in the quantity of phosphate rock, masonry cement, and peat produced (listed in descending order of value). Florida continued as first of two States that processed zirconium concentrates and ilmenite (titanium concentrate), and it rose in rank to second from third in the production of crushed stone, to fourth from fifth in fuller's earth clay, and to fourth from sixth in portland cement. While the State decreased to third from second in magnesium compounds, its mines continued to produce significant quantities of construction sand and gravel and industrial sand and gravel.

Florida is among the States gaining the most in population, with some 25,500 new residents arriving monthly. Basic materials to support infrastructure, the commercial service sector, and housing have been affected. As in recent years, the construction industry has been hampered by an inadequate supply of materials, in particular, shortages of aggregates, cement, and steel. In 2005, the mining and processing of basic construction materials in Florida (limestone or lime-rock aggregates, whether termed gravel or crushed stone, sand, and cement) comprised about 56% of the total nonfuel valuation of all mined mineral resources or mined commodities of the State.

Cement.—High-purity limestone is used to manufacture the clinker for masonry and portland cement. Florida was a major producer and consumer of both types of cement in 2005. Limestone is mined in a number of counties throughout the State; cement clinker was produced only in Alachua, Dade, Hernando, and Suwannee Counties. Cement plants that ground imported clinker operated in Hillsborough and Manatee Counties. American Cement Company has applied for an air construction permit to build a dry process portland cement plant in Sumterville. The City Commission decided in a unanimous vote that Florida Rock Industries was allowed to double the cement-making capacity of its cement plant near Newberry. Suwannee American Cement near Branford was issued a permit to double the size of their mill.

Clays.—Fuller's earth, common clays, and kaolin were mined in several locations in Florida in 2005. Fuller's earth, which was mined in Gadsden and Marion Counties, is typically used as an absorbent material; kaolin, which was mined in Putnam County, is used in the manufacture of paper and refractories. Common clays were mined in Clay and Lake Counties and in smaller quantities from various locations throughout the State.

Phosphate Rock.—CF Industries, Inc., Mosaic Fertilizer, LLC, and PCS Phosphate Co. are the only active phosphate mining companies in Florida. The phosphate industry is located in the counties of Hamilton, Hardee, Hillsborough, Manatee, and Polk. Mosaic closed its Kingsford mine owing to depleted reserves in September 2005. The closure resulted in the elimination of 275 jobs. For general information concerning phosphate mining, please visit the Florida Department of Environmental Protection's Bureau of Mine Reclamation Web site at http://www.dep.state.fl.us/water/mines.

Metals

Titanium and Zirconium.—E.I. du Pont de Nemours & Co., Inc. and Iluka Resources, Inc. continued to operate heavy-mineral titanium and zirconium-bearing sand mines in Baker, Bradford, Clay, and Duval Counties. Ilmenite, leucoxene, rutile, and zircon are the primary minerals of interest in the heavy-mineral sand deposits of this region. Ilmenite, leucoxene, and rutile are the primary ingredients in the manufacture of titanium dioxide pigments, which are used in the manufacture of lacquers, paint, paper, plastics, and varnish. The major uses of zircon are refractories, foundry sands, and ceramic applications. In December 2005, Iluka Resources, Inc. announced that it would undertake a staged closure of its Florida/Georgia operations during 2006 (Iluka Resources Limited, 2006§[3]).

Environmental Issues, Reclamation, and Awards

In 2005, the Florida Department of Environmental Protection (FDEP), Bureau of Mine Reclamation issued 48 permits, largely Environmental Resource Permits (ERP) and Wetland Resource Permits, accounting for 1,831 ha of upland and wetland disturbance and mine expansions and modifications. Records indicate that 64% of land mined for phosphate has been reclaimed since July 1, 1975; the land covered more than 68,800 ha with 44,500 ha having been reclaimed.

Since July 1, 1975, Florida has required that all mined lands be reclaimed, as administered by FDEP's Bureau of Mine Reclamation. In the past 10 years, more than $325 million has been spent on mandatory as well as other related reclamation projects. Mined land has been reclaimed for agricultural, commercial, industrial, recreational, and residential purposes and as sanctuaries for birds and other wildlife. Since 1980, more than 30 million trees have been planted on reclaimed lands. The mining companies have also donated thousands of hectares to State and public entities for recreational uses and for wildlife habitat. The industry has continued to work with the FDEP and other State and Federal agencies to protect and to restore ecosystems and to benefit wildlife. Of the commodities mined in Florida, phosphate mining is the most land intensive. In 2005, approximately 1,800 ha (4,525 acres) of land was mined for phosphate. All phosphate lands disturbed from July 1, 1975, have a mandatory reclamation requirement. Reclamation standards for phosphate lands are detailed in Chapter 62C-16 of the Florida Administrative Code.

Florida Limerock & Aggregate Institute (FLAI), whose members represent about 85% of the construction aggregates operators in the State, was honored on March 17, 2005, as National Stone, Sand & Gravel Association's (NSSGA) State Association of the Year for 2004 at NSSGA's annual convention in Las Vegas. NSSGA's President and CEO recognized with this award how highly NSSGA valued and respected the work FLAI has done and the Institute's leadership in promoting the interest of the aggregates industry in Florida. FLAI was congratulated for their successful partnership with NSSGA on numerous workshops and seminars that have delivered excellent training

[3]A reference that includes a section mark (§) is found in the Internet Reference Cited section.

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to aggregate industry workers, as well as the work they have completed with Florida legislators, governmental agencies, students, and educators in delivering the positive story of the production and use of aggregates as "a model for the industry."

Government Programs

The erosional impacts of hurricanes Charlie, Frances, Ivan, and Jeanne on the coasts of Florida in 2004 brought resounding responses from Federal and State Governments. In 2004, the Florida Legislature added an emergency appropriation of $68.4 million to its $30 million annual expenditure level for beach restoration. These funds are, in part, used to cost-share with local governments and with the U.S. Army Corps of Engineers, funding of more than $160 million for some 15 Florida beach restoration projects. While most of the funding is used in design phases and dredging and pumping activities, part of this total funding is used for conducting sand search studies in offshore waters. Marine sources of sand for restoration work have been the norm for decades because upland sources have become diminished and (or) not economic.

The FGS and the MMS have entered into a multiyear cooperative agreement (cooperative agreement no. 1435-0001-30757) with the specific goal of locating and characterizing the areal extent and volume of available sands suitable for beach nourishment that lie in Federal waters adjacent to State submerged lands off the northeast coast of Florida. In the second year of this study, 306 km of seismic data were collected offshore in Nassau, Duval, and Flagler Counties. These data were subsequently processed, interpreted, and integrated with the data collected in the first year. A total of 52 vibracores were collected offshore in Duval and Nassau Counties. Initial analysis of all vibracore data available for inclusion in the FGS and MMS report indicates inferred potential reserves of up to 152 million cubic meters of restoration-quality sand are offshore of southern Duval County. The analysis of planned vibracores for the third-year report will help identify the quality and quantity of potential reserves offshore of northern Duval County and all of Nassau County.

Geologic mapping continued during 2005 with Federal matching funding from the STATEMAP program, a component of the USGS National Cooperative Mapping Program, which is congressionally mandated by the National Cooperative Geologic Mapping Program (NCGMP). The USGS distributes Federal funds through NCGMP to support geologic mapping efforts, utilizing a competitive funding process. The NCGMP has three primary components: (1) FEDMAP, which funds Federal geologic mapping projects, (2) STATEMAP, which is a matching-funds grant program with State geological surveys, and (3) EDMAP, a matching-funds grant program with universities that has a goal to train the next generation of geologic mappers. In 2005, the FGS completed geologic mapping for the eastern portion of the USGS 1:100,000-scale Gainesville quadrangle and completed the final maps and cross sections for the same area. The completed maps and cross sections are available as part of the FGS open-file map series (Evans and others, 2004).

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TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN FLORIDA[1, 2]

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral	2003		2004		2005	
	Quantity	Value	Quantity	Value	Quantity	Value
Cement:						
Masonry	674	82,900 e	763	97,600 e	902	129,000 e
Portland	4,190	323,000 e	5,230	432,000 e	5,730	519,000 e
Clays:						
Common	94 e	1,280 e	W	W	W	W
Fuller's earth	W	W	234	W	279	W
Kaolin	31	3,250	31	3,280	29	3,510
Gemstones	NA	1	NA	1	NA	1
Lime	--	--	24	2,090	23	2,940
Peat	373	7,440	478	9,710	464	9,450
Sand and gravel:						
Construction	30,900	141,000	29,300	146,000	37,500	210,000
Industrial	624	7,270	679	8,520	715	9,410
Stone, crushed	97,100	587,000	105,000 [3]	680,000 r, 3	115,000 [3]	994,000 [3]
Combined values of magnesium compounds, phosphate rock, staurolite, stone (crushed sandstone [2004-05]), titanium concentrates, zirconium concentrates, and values indicated by symbol W	XX	918,000	XX	945,000	XX	1,010,000
Total	XX	2,070,000	XX	2,320,000 r	XX	2,890,000

eEstimated. rRevised. NA Not available. W Withheld to avoid disclosing company proprietary data. Withheld values included in "Combined value" data.
XX Not applicable. -- Zero.

[1]Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2]Data are rounded to no more than three significant digits; may not add to totals shown.
[3]Excludes certain stones; kind and value included with "Combined values" data.

TABLE 2
FLORIDA: CRUSHED STONE SOLD OR USED, BY KIND[1]

Kind	2004			2005		
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Number of quarries	Quantity (thousand metric tons)	Value (thousands)
Limestone[2]	77 r	102,000 r	$666,000 r	84	110,000	$963,000
Dolomite	4	1,030	7,260 r	4	982	7,370
Shell	3	1,150	6,110	4	4,040	24,000
Total	XX	105,000	680,000 r	XX	115,000	994,000

rRevised. XX Not applicable.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes limestone-dolomite reported with no distinction between the two.

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TABLE 3

FLORIDA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2005, BY USE[1]

(Thousand metric tons and thousand dollars)

Use	Quantity	Value
Construction:		
Coarse aggregate (+1½ inch):		
Macadam	W	W
Riprap and jetty stone	51	927
Filter stone	119	1,910
Other coarse aggregate	706	6,770
Total	876	9,600
Coarse aggregate, graded:		
Concrete aggregate, coarse	2,620	41,400
Bituminous aggregate, coarse	(2)	(2)
Other graded coarse aggregate	13,600	185,000
Total	16,200	226,000
Fine aggregate (-⅜ inch):		
Stone sand, concrete	(3)	(3)
Stone sand, bituminous mix or seal	(3)	(3)
Screening, undesignated	1,410	17,600
Other fine aggregate	9,800	104,000
Total	12,400	128,000
Coarse and fine aggregates:		
Graded road base or subbase	14,000	66,200
Crusher run or fill or waste	2,040	7,920
Other coarse and fine aggregates	10,700	101,000
Total	26,700	175,000
Other construction materials	2,650	12,700
Agricultural:		
Agricultural limestone	620	5,080
Other agricultural uses	54	240
Total	674	5,320
Chemical and metallurgical:		
Cement manufacture	6,150	18,200
Chemical stone	(3)	(3)
Sulfur oxide removal	(3)	(3)
Total	6,950	29,300
Special, other fillers or extenders	(4)	(4)
Other miscellaneous uses and specified uses not listed	84	798
Unspecified:[5]		
Reported	41,300	348,000
Estimated	6,900	60,000
Total	48,200	408,000
Grand total	115,000	994,000

W Withheld to avoid disclosing company proprietary data; included with "Other coarse aggregate."

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Withheld to avoid disclosing company proprietary data; included with "Other graded coarse aggregate."

[3]Withheld to avoid disclosing company proprietary data; included in "Total."

[4]Withheld to avoid disclosing company proprietary data; included with "Unspecified: Reported."

[5]Reported and estimated production without a breakdown by end use.

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TABLE 4
FLORIDA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2005, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Construction:						
Coarse aggregate (+1½ inch)[2]	W	W	18	363	W	W
Coarse aggregate, graded[3]	W	W	W	W	5,730	87,300
Fine aggregate (-⅜ inch)[4]	W	W	W	W	3,250	38,600
Coarse and fine aggregates[5]	476	4,610	9,690	44,200	3,590	21,600
Other construction materials	272	2,000	--	--	2,380	10,700
Agricultural[6]	378	2,730	--	--	296	2,590
Chemical and metallurgical[7]	--	--	W	W	W	W
Special[8]	--	--	--	--	W	W
Other miscellaneous uses and specified uses not listed	--	--	--	--	84	798
Unspecified:[9]						
Reported	2,580	18,500	3,800	30,000	13,500	115,000
Estimated	1,200	11,000	1,500	13,000	1,100	9,700
Total	5,770	53,800	17,900	110,000	33,500	302,000

	District 4		Unspecified districts	
	Quantity	Value	Quantity	Value
Construction:				
Coarse aggregate (+1½ inch)[2]	W	W	--	--
Coarse aggregate, graded[3]	9,500	123,000	--	--
Fine aggregate (-⅜ inch)[4]	W	W	--	--
Coarse and fine aggregates[5]	13,000	105,000	--	--
Other construction materials	--	--	--	--
Agricultural[6]	--	--	--	--
Chemical and metallurgical[7]	W	W	554	6,180
Special[8]	--	--	--	--
Other miscellaneous uses and specified uses not listed	--	--	--	--
Unspecified:[9]				
Reported	21,100	183,000	--	--
Estimated	3,000	26,000	--	--
Total	57,000	522,000	554	6,180

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes filter stone, macadam, riprap and jetty stone, and other coarse aggregate.

[3]Includes bituminous aggregate (coarse), concrete aggregate (coarse), and other graded aggregate.

[4]Includes screening (undesignated), stone sand (bituminous mix or seal), stone sand (concrete), and other fine aggregate.

[5]Includes crusher run or fill or waste, graded road base or subbase, and other coarse and fine aggregates.

[6]Includes agricultural limestone and other agricultural uses.

[7]Includes cement manufacture, chemical stone, and sulfur oxide removal.

[8]Includes other fillers or extenders.

[9]Reported and estimated production without a breakdown by end use.

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TABLE 5
FLORIDA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2005, BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	11,500	$79,400	$6.92
Plaster and gunite sands	1,370	8,350	6.08
Asphaltic concrete aggregates and road base materials	2,290	20,000	8.73
Fill	6,370	20,100	3.15
Other miscellaneous uses	2,420	9,500	3.93
Unspecified:[2]			
Reported	7,140	38,200	5.35
Estimated	6,410	34,300	5.35
Total or average	37,500	210,000	5.60

[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Reported and estimated production without a breakdown by end use.

TABLE 6
FLORIDA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2005, BY USE AND DISTRICT[1, 2]

(Thousand metric tons and thousand dollars)

Use	District 1		Districts 2 and 3		District 4	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregates (including concrete sand)[3]	660	2,550	12,200	85,200	--	--
Asphaltic concrete aggregates and road base materials	--	--	2,290	20,000	--	--
Fill	659	855	5,180	16,100	531	3,070
Other miscellaneous uses	--	--	2,420	9,500	--	--
Unspecified:[4]						
Reported	--	--	7,140	38,200	--	--
Estimated	2,270	12,200	4,050	21,600	92	494
Total	3,590	15,600	33,300	191,000	623	3,570

-- Zero.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Districts 2 and 3 are combined to avoid disclosing company proprietary data.
[3]Includes plaster and gunite sands.
[4]Reported and estimated production without a breakdown by end use.

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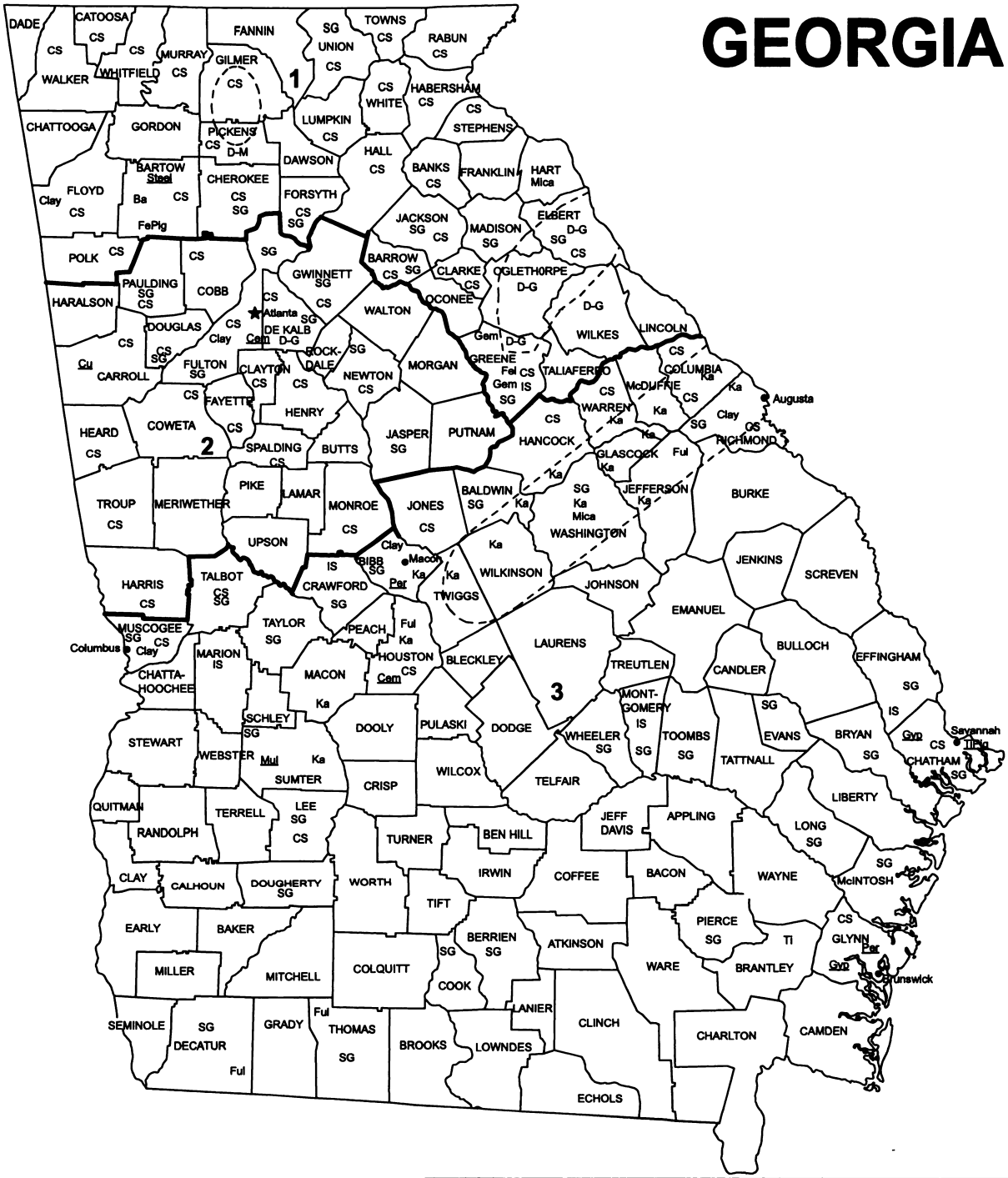
GEORGIA



LEGEND

- County boundary
- ★ Capital
- • City
- 1 Crushed stone/sand and gravel districts

MINERAL SYMBOLS
(Major producing areas)

Ba	Barite	DS	Dimension stone	Mica	Mica
Cem	Cement plant	Fel	Feldspar	Mul	Synthetic mullite plant
Clay	Common clay	FePig	Iron oxide pigments	Per	Perlite plant
CS	Crushed stone	Ful	Fuller's earth	SG	Construction sand and gravel
Cu	Copper plant	Gem	Gemstones	Steel	Steel plant
D-G	Dimension granite	Gyp	Gypsum plant	TI	Titanium minerals
D-M	Dimension marble	IS	Industrial sand	TiPig	Titanium dioxide pigment plant
		Ka	Kaolin		Concentration of mineral operations

0 50 Kilometers

Source: Georgia Geologic Survey/U.S. Geological Survey (2005)

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THE MINERAL INDUSTRY OF GEORGIA

In 2005, Georgia's nonfuel raw mineral production was valued[1] at $1.81 billion, based upon annual U.S. Geological Survey (USGS) data. Although increases and decreases took place in most of the State's mineral commodity values, many being significant, the value of nonfuel mineral production was the same as it was in 2004, which then was up 4% from 2003. The State was ninth in rank (eighth in 2004) among the 50 States in total nonfuel mineral production value, of which Georgia accounted for about 3.3% of the U.S. total.

Georgia was by far the leading clay-producing State in the Nation in 2005, accounting for slightly more than 24% of total U.S. clay production (all kinds) and producing more than 2.4 times the quantity of clay as the next highest producing State. Kaolin remained the State's foremost nonfuel raw mineral commodity, accounting for nearly 46% of Georgia's total nonfuel mineral production value and, of that, about 84% of its total clay value. Crushed stone was second, accounting for more than 33% of the State's nonfuel mineral value, followed by fuller's earth, construction sand and gravel, and cement (masonry and portland).

In 2005, increases in value of $58 million in crushed stone (production down slightly), nearly $29 million in construction sand and gravel (production up nearly 20%), and $5 million in fuller's earth accounted for the largest increases in Georgia's nonfuel minerals for the year. Smaller yet significant increases also took place in the values of industrial sand and gravel and lime. But these increases were balanced out, especially by decreases in the values of kaolin, down $73 million, and cement, resulting in the State's same total value as in 2004. Although kaolin production increased by about 6% in 2005, the commodity's value dropped by about 8%. Cement production and value showed a significant decrease, while smaller decreases took place in the values of barite, dimension stone, feldspar, and mica (table 1).

In 2005, Georgia continued to lead the Nation in the quantities of kaolin, fuller's earth, and iron oxide pigments produced (descending order of value). It remained second of two barite-producing States, fourth in common clays, fifth in feldspar, and eighth in masonry cement. While the State rose to second from third in dimension stone, it decreased to fifth from third in mica, and to sixth from fifth in crushed stone. Additionally, Georgia was a significant producer of construction sand and gravel and industrial sand and gravel.

[1]The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2005 USGS mineral production data published in this chapter are those available as of December 2006. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—can be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN GEORGIA[1,2]

(Thousand metric tons and thousand dollars)

Mineral	2003		2004		2005	
	Quantity	Value	Quantity	Value	Quantity	Value
Clays:						
Common	1,280	4,430	1,550	8,710	1,530	8,730
Fuller's earth	1,570	145,000	1,400	142,000	1,410	147,000
Kaolin	6,610	884,000	6,780	898,000	7,190	825,000
Gemstones	NA	8	NA	9	NA	9
Sand and gravel:						
Construction	7,690	31,800	9,270	39,400	11,100	68,300
Industrial	590	11,900	665	13,400	689	15,000
Stone:						
Crushed	75,200	519,000	79,700 r	548,000 r	79,400	606,000
Dimension	114	22,700	146	22,100	246	21,000
Combined values of barite, cement, feldspar, iron oxide pigments (crude), lime, mica, (crude)	XX	117,000	XX	134,000	XX	115,000
Total	XX	1,740,000	XX	1,810,000 r	XX	1,810,000

rRevised. NA Not available. XX Not applicable.
[1]Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2]Data are rounded to no more than three significant digits; may not add to totals shown.

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TABLE 2
GEORGIA: CRUSHED STONE SOLD OR USED, BY KIND[1]

Kind	2004 Number of quarries	2004 Quantity (thousand metric tons)	2004 Value (thousands)	2005 Number of quarries	2005 Quantity (thousand metric tons)	2005 Value (thousands)
Limestone	18	8,450	$60,400 r	16	8,690	$66,900
Marble	6 r	1,530	9,960	6	1,740	14,100
Granite	53	67,800	463,000 r	54	66,900	509,000
Quartzite	2	1,870	14,900	2	2,110	16,100
Total	XX	79,700 r	548,000 r	XX	79,400	606,000

rRevised. XX Not applicable.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.

TABLE 3
GEORGIA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2005, BY USE[1]

(Thousand metric tons and thousand dollars)

Use	Quantity	Value
Construction:		
Coarse aggregate (+1½ inch):		
Riprap and jetty stone	1,640	19,700
Other coarse aggregates	254	2,740
Total	1,900	22,400
Coarse aggregate, graded:		
Concrete aggregate, coarse	12,600	107,000
Bituminous aggregate, coarse	W	W
Bituminous surface-treatment aggregate	W	W
Railroad ballast	W	W
Other graded coarse aggregates	3,150	26,800
Total	21,000	179,000
Fine aggregate (-⅜ inch):		
Stone sand, concrete	W	W
Stone sand, bituminous mix or seal	W	W
Screening, undesignated	121	344
Other fine aggregate	1,300	6,820
Total	7,040	50,600
Coarse and fine aggregates:		
Graded road base or subbase	W	W
Terrazzo and exposed aggregate	W	W
Crusher run or fill or waste	272	1,120
Other coarse and fine aggregates	2,460	13,100
Total	11,800	71,700
Agricultural:		
Agricultural limestone	(2)	(2)
Other agricultural uses	(2)	(2)
Chemical and metallurgical, cement manufacture	(2)	(2)
Special, other fillers or extenders	(2)	(2)
Unspecified:[3]		
Reported	34,200	255,000
Estimated	2,000	15,000
Total	36,200	270,000
Grand total	79,400	606,000

W Withheld to avoid disclosing company proprietary data; included in "Total."
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Withheld to avoid disclosing company proprietary data; included in "Grand total."
[3]Reported and estimated production without a breakdown by end use.

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TABLE 4
GEORGIA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2005, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Construction:						
Coarse aggregate (+1½ inch)[2]	W	W	W	W	W	W
Coarse aggregate, graded[3]	W	W	16,200	139,000	W	W
Fine aggregate (-⅜ inch)[4]	W	W	W	W	W	W
Coarse and fine aggregates[5]	W	W	W	W	W	W
Agricultural[6]	W	W	--	--	--	--
Chemical and metallurgical[7]	--	--	--	--	W	W
Special[8]	W	W	--	--	--	--
Unspecified:[9]						
Reported	13,600	101,000	4,550	34,700	16,100	119,000
Estimated	2,000	15,000	--	--	--	--
Total	25,000	194,000	35,600	275,000	18,800	137,000

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes riprap and jetty stone and other coarse aggregate.

[3]Includes bituminous aggregate (coarse), bituminous surface-treatment aggregate, concrete aggregate (coarse), railroad ballast, and other graded coarse aggregate.

[4]Includes screening (undesignated), stone sand (bituminous mix or seal), stone sand (concrete), and other fine aggregate.

[5]Includes crusher run or fill or waste, graded road base or subbase, terrazzo and exposed aggregate, and other coarse and fine aggregates.

[6]Includes agricultural limestone and other agricultural uses.

[7]Includes cement manufacture.

[8]Includes other fillers or extenders.

[9]Reported and estimated production without a breakdown by end use.

TABLE 5
GEORGIA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2005, BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	7,580	$49,400	$6.52
Plaster and gunite sands	558	2,980	5.34
Concrete products (blocks, bricks, pipe, decorative, etc.)	165	936	5.68
Asphaltic concrete aggregates and road base materials	W	W	7.43
Fill	52	191	3.66
Other miscellaneous uses[2]	41	347	8.46
Unspecified:[3]			
Reported	1,230	6,140	4.98
Estimated	1,510	8,300	5.51
Total	11,100	68,300	6.14

W Withheld to avoid disclosing company proprietary data; included in "Other miscellaneous uses."

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes filtration.

[3]Reported and estimated production without a breakdown by end use.

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TABLE 6

GEORGIA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2005, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregates and concrete products[2]	3,920	30,800	190	1,410	4,200	21,100
Asphaltic concrete aggregates and other bituminous mixtures	W	W	--	--	--	--
Road base and coverings	W	W	--	--	--	--
Fill	7	60	--	--	46	131
Other miscellaneous uses[3]	40	331	--	--	1	16
Unspecified:[4]						
Reported	--	--	--	--	931	4,730
Estimated	--	--	148	816	1,360	7,480
Total	3,960	31,200	338	2,220	6,540	33,500

	Unspecified district	
	Quantity	Value
Concrete aggregates and concrete products[2]	--	--
Asphaltic concrete aggregates and other bituminous mixtures	--	--
Road base and coverings	--	--
Fill	--	--
Other miscellaneous uses[3]	--	--
Unspecified:[4]		
Reported	301	1,410
Estimated	--	--
Total	301	1,410

W Withheld to avoid disclosing company proprietary data; included in "Other miscellaneous uses." -- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes plaster and gunite sands.

[3]Includes filtration.

[4]Reported and estimated production without a breakdown by end use.

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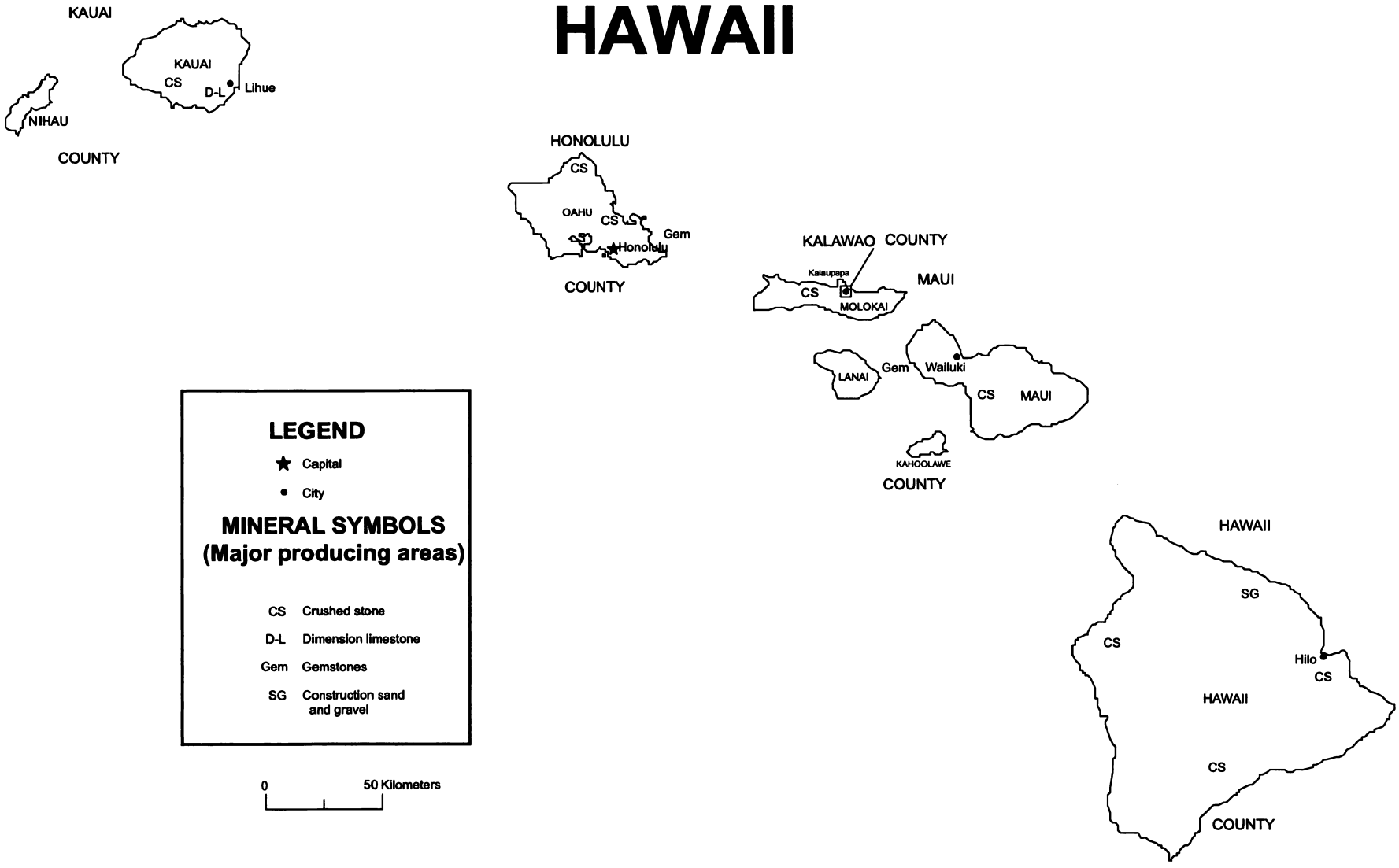
HAWAII



Source: Hawaii Commission on Water Resource Management/U.S. Geological Survey (2005)

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The Mineral Industry of Hawaii

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Hawaii Department of Land and Natural Resources, Commission on Water Resource Management, for collecting information on all nonfuel minerals.

In 2005, Hawaii nonfuel raw mineral production was valued[1] at $100 million, based upon annual U.S. Geological Survey (USGS) data. This was an increase in value of about 36% compared with that of 2004, which followed a decrease of 1.9% from 2003 to 2004. Mining in Hawaii consisted mostly of the quarrying of stone, used to produce crushed stone, and the extraction of sand and gravel from open pits, both commodities produced for use by the construction industry. Gemstones, in significant quantities, also were produced, mostly black coral and precious coral.

In 2005, significant increases took place in the production and especially the values of both of the aggregates. Crushed stone value rose by $21 million, up more than 34% from that of 2004, with a 12.8% increase in production. The value of construction sand and gravel was up $5.4 million, 44.6% more than in 2004, resulting from a 10.3% increase in production. Although having minimal effect on the State's overall change in value, gemstones production, based on value, decreased by $45,000 to $217,000 in 2005; this followed a more than doubling of gemstone value in 2004 from 2003 (table 1).

Hawaii Cement Co. produced a small quantity of masonry cement in 2003 from what remained of the company's stockpiled portland cement materials (table 1). In 2001, Hawaii Cement had decided to stop production at its plant on the island of Oahu, Honolulu County, and rely solely on imported cement. This operation, which had produced cement from imported clinker, was the only cement plant in the State. (Clinker is the intermediate, kiln-processed product of cement manufacture.) The company stopped importing clinker in March 2001 and permanently closed its grinding plant in September (van Oss, 2003, p. 16.3). In 2001, in coordination with the shutdown, the company completed construction of its twin 30,000-metric-ton cement silos for storage of imported cement (Wurlitzer, 2001).

[1]The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2005 USGS mineral production data published in this chapter are those available as of December 2006. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—can be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

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TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN HAWAII[1, 2]

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral	2003		2004		2005	
	Quantity	Value	Quantity	Value	Quantity	Value
Cement, masonry	W	(3)	--	--	--	--
Gemstones	NA	119	NA	262	NA	217
Sand and gravel, construction	808	9,560	1,260	12,100	1,390	17,500
Stone, crushed	5,620	65,400	5,470 r	61,300 r	6,170	82,300
Total	XX	75,100	XX	73,700 r	XX	100,000

rRevised. NA Not available. W Withheld to avoid disclosing company proprietary data. XX Not applicable. -- Zero.
[1]Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2]Data are rounded to no more than three significant digits; may not add to totals shown.
[3]Value excluded to avoid disclosing company proprietary data.

TABLE 2
HAWAII: CRUSHED STONE SOLD OR USED, BY KIND[1]

Kind	2004			2005		
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Number of quarries	Quantity (thousand metric tons)	Value (thousands)
Limestone	1	8	$126	1	W	W
Traprock	17 r	4,760 r	54,700 r	18	5,420	$72,000
Volcanic cinder and scoria	1	348	2,990	4	W	W
Miscellaneous stone	2 r	356	3,490	2	419	4,320
Total	XX	5,470 r	61,300 r	XX	6,170	82,300

rRevised. W Withheld to avoid disclosing company proprietary data; included in "Total." XX Not applicable.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.

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TABLE 3
HAWAII: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2005, BY USE[1]

(Thousand metric tons and thousand dollars)

Use	Quantity	Value
Construction:		
Coarse aggregate (+1½ inch):		
Macadam	W	W
Riprap and jetty stone	W	W
Filter stone	W	W
Other coarse aggregates	149	1,690
Total	231	3,600
Coarse aggregate, graded:		
Concrete aggregate, coarse	548	8,780
Bituminous aggregate, coarse	W	W
Bituminous surface-treatment aggregate	W	W
Other graded coarse aggregates	214	3,720
Total	795	13,000
Fine aggregate (-⅜ inch):		
Stone sand, concrete	494	15,800
Stone sand, bituminous mix or seal	(2)	(2)
Other fine aggregates	175	3,220
Total	669	19,000
Coarse and fine aggregates:		
Graded road base or subbase	385	5,030
Crusher run or fill or waste	882	7,160
Other coarse and fine aggregates	227	3,740
Total	1,490	15,900
Other construction materials	3	53
Agricultural, other agricultural uses	4	55
Unspecified, estimated[3]	3,000	37,000
Grand total	6,170	82,300

W Withheld to avoid disclosing company proprietary data; included in "Total."
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Withheld to avoid disclosing company proprietary data; included with "Other fine aggregate."
[3]Estimated production without a breakdown by end use.

TABLE 4
HAWAII: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2005, BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	388	W	W
Concrete products (blocks, bricks, pipe, decorative, etc.)[2]	22	W	W
Asphaltic concrete aggregates and road base materials	154	W	W
Fill	173	W	W
Other miscellaneous uses	30	W	W
Unspecified, estimated[3]	627	$7,600	$12.13
Total or average	1,390	17,500	12.54

W Withheld to avoid disclosing company proprietary data; included in "Total or average."
[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.
[2]Includes plaster and gunite sands.
[3]Estimated production without a breakdown by end use.

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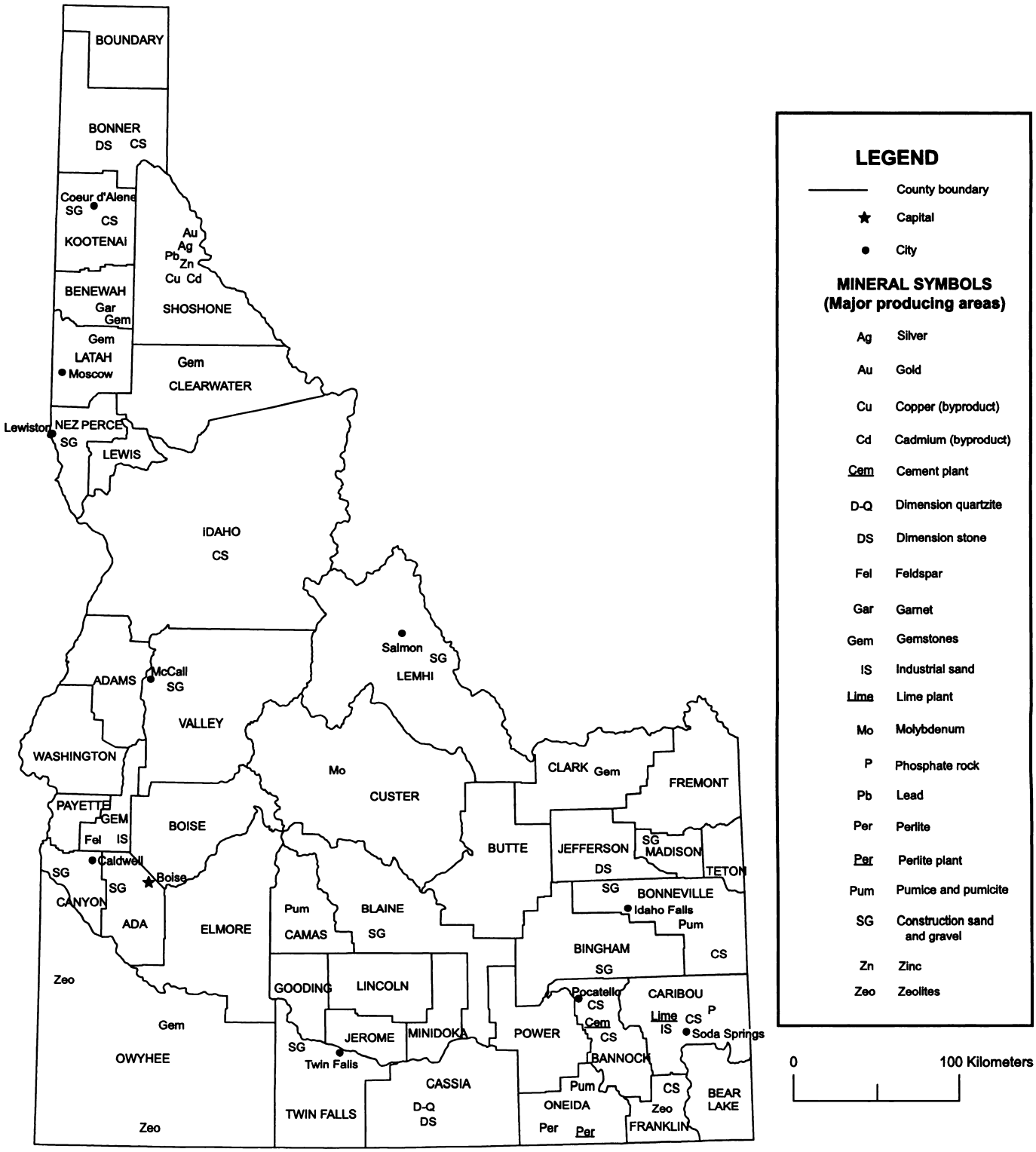

LEGEND

———	County boundary
★	Capital
●	City

MINERAL SYMBOLS (Major producing areas)

Ag	Silver
Au	Gold
Cu	Copper (byproduct)
Cd	Cadmium (byproduct)
Cem	Cement plant
D-Q	Dimension quartzite
DS	Dimension stone
Fel	Feldspar
Gar	Garnet
Gem	Gemstones
IS	Industrial sand
Lime	Lime plant
Mo	Molybdenum
P	Phosphate rock
Pb	Lead
Per	Perlite
Per	Perlite plant
Pum	Pumice and pumicite
SG	Construction sand and gravel
Zn	Zinc
Zeo	Zeolites

0 100 Kilometers

Source: Idaho Geological Survey/U.S. Geological Survey (2005)

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The Mineral Industry of Idaho

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Idaho Geological Survey for collecting information on all nonfuel minerals.

In 2005, Idaho's nonfuel mineral production was valued[1] at $906 million based upon annual U.S. Geological Survey (USGS) data. This was a nearly 103% increase from the State's total nonfuel mineral value for 2004, which was up slightly more than 66% from that of 2003. The State climbed to 21st from 34th in rank among the 50 States in total nonfuel mineral production value, of which Idaho accounted for more than 1.6% of the U.S. total value. Yet, per capita, the State ranked seventh in the Nation in its minerals industry's value of nonfuel mineral production; with a population of about 1,430,000, the value of production was about $634 per capita.

Molybdenum concentrates, phosphate rock, construction sand and gravel, silver, portland cement, crushed stone, and lead were, in descending order of value, Idaho's leading nonfuel minerals and accounted for more than 97% of the State's total nonfuel mineral production value in 2005. Industrial minerals accounted for about 29% of the State's total nonfuel mineral value; molybdenum concentrates, silver, lead, copper, zinc, and gold (descending order of value) accounted for the remainder. In 2005, the largest increases in value were for molybdenum concentrates and construction sand and gravel. A substantial increase in molybdenum concentrate production and a significantly more substantial increase in the commodity's unit value (specific data withheld—company proprietary data) led the State's increase in total nonfuel mineral production value for the year. A $19.5 million, or 26%, increase in the total value of construction sand and gravel resulted from a 6% increase in its production and a nearly 19% increase in the commodity's average unit value. Significant increases also took place in the production and the values of crushed stone and lead, as well as in the overall value and average unit value of phosphate rock, the production of which was down, slightly (table 1). The largest decrease in value took place in silver, down about $2 million, despite an approximate 10% increase in unit value.

During the past 7 years, the relative values of metals and of industrial minerals, each as a percentage of the State's total nonfuel mineral production value, have fluctuated significantly. From a relatively recent high of 45% in 1999, the percentage of metals dropped to 28% in 2001[2], increased to 29% in 2002 and 30% in 2003, after which it rose sharply to 48% in 2004. However, in 2005, the percentage of metals value rose even more sharply to a reversal of the percentages of 2003 with the values of metals reaching more than 71% and industrial minerals about 29% of the State's total nonfuel mineral production value. Although increases in the values of lead, silver, and zinc were part of this rise in metal production value from 2003 through 2005, the largest portion of this dramatic increase was owing to a substantial increase in the average price of molybdenum concentrates mined from Thompson Creek Mining Co.'s large open pit molybdenum mine in Custer County. The trend toward the recent heights in molybdenum concentrate prices began in June 2002 and continued on throughout 2003 and 2004, peaking in 2005. For example, as reported in Platts Metals Week (there in dollars per pound of contained molybdenum) the annual average price of molybdic oxide rose from $8.27 per kilogram (kg) in 2002 to $11.75 per kg in 2003 to $36.73 per kg in 2004 and nearly doubled to $70.10 per kg (about $32 per pound) in 2005. In June 2005, the monthly average molybdic oxide price reached its highest point of the 4-year run at $82.54, and then followed a generally downward trend the rest of the year to close at $61.84. Molybdenum concentrate prices had stayed relatively level during the early months of 2006.

In 2005, Idaho continued to rank second in the quantity of zeolites produced, second of three industrial-garnet-producing States, third in silver and lead (descending order of value), and fourth in molybdenum concentrates. The State decreased to third from second of four phosphate rock-producing States, to fifth from third in pumice and pumicite, to eighth from fifth in gemstones (gemstones based upon value), and it continued to be a significant producer of construction sand and gravel and industrial sand and gravel.

The Idaho Geological Survey[3] (IGS) provided the narrative information that follows. Production data in the text that follows are those reported by the IGS and are based on the agency's own surveys and estimates or information gathered from company annual reports. They may differ from production figures published by the USGS. Mining employment for the last quarter of 2005 was 2,130 persons, about 8.7% more than the annual number for 2004. In 2004, employment at the State's metal and nonmetal mines increased more than 10% to 1,960 compared with 1,769 in 2003. Putting this in a larger perspective, these numbers did not include the approximately 1,000 workers at three large phosphate-processing chemical plants in southeastern Idaho.

With Idaho's nonfuel mineral production value more than doubled in 2005, the $906 million that was reached was a new record high for the State. The increase in value of molybdenum concentrates was more than 250%, due in part to the increase in production, but more so to the increased price of molybdic

[1]The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2005 USGS mineral production data published in this chapter are those available as of December 2006. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—can be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

[2]The State's lower percentage of metals value of 2001 resulted in large part because of a substantial decrease in gold production in 2001 from that of 2000, which continued to decrease significantly in 2002 mostly as a result of the closing down of operations at the Beartrack Mine in Lemhi County. Gold production ceased in the State during 2003 but resumed in 2005.

[3]Virginia S. Gillerman, Associate Research Geologist/Economic Geologist, authored the text of the State mineral industry information provided by the Idaho Geological Survey.

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oxide, as well as that of ferromolybdenum. In addition to record prices for molybdenum, higher prices for silver and the base metals boosted the value of metals during the year. Ores of silver, along with those containing lead, copper (in one mine), and zinc were extracted from two underground mines in the Coeur d'Alene District in Shoshone County, still producing silver after 120 years of mining. In 2004, the IGS updated Idaho's historic gold production data. From 1978 through 2004, nearly 77,800 kg (about 2.5 million troy ounces) of gold was mined, principally from open pit operations in the State. That raised the State's total historic gold production to close to 386,000 kg (12.4 million troy ounces). Although Idaho is not a major gold-producing State, the relatively recent high prices on the market fueled several exploration projects, and a new small gold mine, New Jersey Mining Co.'s Golden Chest Mine, opened at Murray in eastern-central Shoshone County.

The State's industrial minerals sector was generally in a steady to growing state as compared with the past several years. Idaho's construction boom and a robust economy continued to create an active raw minerals and materials demand, especially for aggregate, cement, and dimension stone. Three large open pit phosphate mines and three associated processing plants continued to operate, one in Bannock County and the other two in Caribou County, in southeastern Idaho.

Exploration and Development Activities

Industrial Minerals

Exploration for industrial minerals mainly was limited to the search for phosphate rock and to I-minerals Inc.'s Helmer-Bovill feldspar-clay-quartz project in Latah County. I-minerals collected a 36-metric-ton (t) [40-short-ton (st)] bulk sample of potassium feldspar for metallurgical testing to be performed in a North Carolina facility. The company also drilled 35 HQ core holes in the Kelly's Basin area to evaluate that area's feldspar grades. J.R. Simplot Co.'s draft environmental impact statement (EIS) for a controversial expansion into the Manning Creek lease in Caribou County was released at year's end, and the company conducted another large drilling program on its Dairy Syncline lease, also in Caribou County.

Metals

Cobalt.—In eastern central Idaho, Formation Capital Corp.'s Idaho Cobalt Project in Lemhi County was one of the largest development projects in the State. Formation Capital and its contractors worked on the EIS for its proposed new cobalt/copper/gold underground mine. A preliminary draft EIS was released by the Salmon-Challis National Forest at yearend and was scheduled to be released to the public in the spring 2006. Exploration drilling in 2005 generally was hampered by poor ground conditions early in the year; nevertheless by yearend, about 2,040 meters (m) of drilling in 11 diamond drill holes had been completed. In the R05-07 hole, the company intersected a nearly 4.5-meter wide zone that assayed at 0.98% cobalt, 0.19% copper and 0.0521 troy ounces per short ton [1.62 grams per short ton (g/st) or about 1.79 grams per metric ton g/t)] gold at the 122 m (400 feet) depth. A new feasibility study and reserve update on the Ram deposit were due to be completed in early 2006.

Gold.—New Jersey Mining Co. (Kellogg, ID) drilled four diamond drill holes totaling 610 m in the Idaho vein at its Golden Chest Mine, and intersected one 2.4-m intercept (section) that assayed 23.3 g/t (about 0.68 troy ounces per short ton) gold. New Jersey Mining also received its permit from the U.S. Forest Service in July to open the Silver Strand Mine, northeast of Coeur d'Alene. This underground mine operation will exploit a high-grade gold-silver vein in the Revett Formation; mine construction was to begin in 2006. The seasonal operation plan was to mine about 5,000 metric tons per year of ore to be processed at its Kellogg mill.

To the south in north central Idaho, Valencia Ventures, Inc. held the Petsite gold project property at Orogrande, Idaho County. Vista Gold Corp. continued to hold the Stibnite gold property in Valley County. American Independence Mines and Minerals, Inc. did surface preparation work at the Golden Hand lode mine project, north of Edwardsburg in the Payette National Forest. At Warren, Kimberly Gold Mines, Inc. drilled four short holes (underground) at the Rescue Mine in central Idaho to test the gold-quartz vein intersects.

In Lemhi County, Journey Resources Corp. picked up the Musgrove Creek property from Wave Exploration Corp., which drilled the property in 2004. The deposit holds an NI43-101 resource of about 9,770 kg (314,000 troy ounces) of gold (Association of Professional Geoscientists of Ontario, 2003§[4]), and to the east in Clark County, Kilgore Minerals, Ltd. continued to hold the Kilgore gold property.

Twin Mining Corp. [the owner of Atlanta Gold Corporation of America, Inc.] worked on permitting studies, including air and water monitoring and mine planning, for its proposed open pit heap-leach gold mine at Atlanta, Elmore County, in southwestern Idaho. The Atlanta Gold project, which hosts a reserve of 12.3 t of ore at 2.1 g/t (0.06 troy ounces per st) gold and 5.5 g/t (0.16 troy ounce per st) silver, is at the headwaters of the Middle Fork of the Boise River. However, financing problems delayed the project, which had been meeting with opposition from the Idaho Conservation League, in part owing to difficulties with arsenic-bearing drainage from an old adit. The two parties negotiated a solution in October, whereby Atlanta agreed to install a water-treatment system with the eventual objective of designing a passive treatment facility to take care of the problematic adit drainage (Gillerman, Weaver, and Bennett, 2006§). Additionally, many people nearby and in the surrounding areas were concerned about cyanide use at the Atlanta project. A much smaller project in the Neal District, closer to Boise, also received much public scrutiny over its application (later withdrawn) for a cyanide permit.

Molybdenum.—Molybdenum was the exploration target for Kobex Resources Ltd., which picked up the Cumo property from Mosquito Consolidated Gold Mines Ltd. in March. The deep moly deposit was discovered by Amax Exploration Inc. in the 1970s, and nearly 11,000 m of drilling defined about 1.18 billion t ore grading at 0.093% molybdenum sulfide with a higher grade core. The deposit is located near the headwaters

[4]References that include a section mark (§) are found in the Internet References Cited section.

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of Grimes Creek in a remote part of Boise County. Drill permits were received late in the year.

Silver.—Since 1884, northern Idaho's Coeur d'Alene District in Shoshone County has produced about 36.7 million kg (more than 1.18 billion troy ounces) of silver from high-grade, quartz-siderite-sulfide veins with copper and/or lead byproduct credits. Silver prices rose to about $270 per kilogram (as much as $8.50 per troy ounce) during the year, helping to fund the Gold Hunter expansion project at Hecla Mining Co.'s Lucky Friday Mine in Mullan. An additional 610 m (2,000 feet) of drift was completed on the 1,800-m level (5,900-foot) access from the mine's Silver Shaft, plus lateral drifting along the vein and installation of I drifts. Exploration drilling down to the 1,950-m level successfully tested one-half the strike length of the vein, helping to result in a doubling of reserves. Mill improvements also were made. Coeur d'Alene Mines Corp. implemented an aggressive exploration program, targeting fault-hosted high-grade veins with a 17,700-meter (58,000-foot) drill program. While still producing more than 2 million troy ounces of silver in 2005, production for the year dropped off at Coeur d'Alene Mines' Coeur Silver Valley operations, which encompassed the Coeur Mine and the Galena Mine (Shoshone County) because of reduced access to areas of the mine that were undergoing redevelopment (Coeur d'Alene Mines Corporation, 2006).

Sterling Mining Co. continued to evaluate and rehabilitate the Sunshine Mine, an 11.2-million-kg (360-million-troy ounce) life-of-mine silver producer that it acquired in 2003. The primary hoists of the mine's Jewell Shaft were reconditioned, including new hoist cables, and these were operational down to the 945-m level (3,100-foot) as of April 2004. Spencer Engineering of Ontario, Canada, was hired to refurbish the ventilation and escapeway systems at the Silver Summit Mine and Silver Dollar Tunnel portions of the mine that were in need of work to meet strict Federal mine hoist regulations. The company acquired properties next to the Sunshine and planned drilling of geophysical and geologic targets on the Yankee Girl vein structures.

Other Metals Projects.— Timberline Resources Corp. drilled 10 core holes, totaling 1,250 m, at its Snowstorm Project to test for stratabound copper-silver mineralization in the Revett Formation in northern Idaho, Shoshone County. In southern Idaho's Custer County in the Mackay District, Trio Gold Corp. drilled 10 holes totaling more than 700 m early in the year to test for copper mineralization in skarn and evaluate solvent extraction processing. Unity Gold-Silver Mines Inc. and Sidney Resources Corp. also worked claims in and near the Warren Minerals District, Idaho County.

Commodity Review

Industrial Minerals

Dimension Stone.— Dimension stone operations, including those for Oakley Stone in Cassia County, and L and W Stone Corp.'s quarry in Custer County, had productive years concurrent with the strong housing market. In a ruling on a suit aimed at stopping a previously approved expansion of L and W Stone's operation at Three Rivers Stone flagstone quarry west of Challis, a judge allowed the company to continue operations, with the requirement that the company prepare a full EIS with the U.S. Department of the Interior's Bureau of Land Management regarding the expansion. The quarry ships more than 27,200 t of stone in a season (Gillerman, Weaver, and Bennett, 2006§). In a joint venture with Hess Pumice Products, Inc., Owens-Corning built a manufacturing plant at Malad to produce a manufactured stone veneer called Cultured Stone, popular in construction.

Phosphate Rock.—Three companies, Agrium Inc., J.R. Simplot Co., and Monsanto Co., extracted and processed more than 4 million metric tons of ore from the Permian Phosphoria Formation in Caribou County in southeastern Idaho. Although phosphate rock production and the commodity's market were stable, for the second consecutive year phosphate was surpassed in raw ore value by a metal (molybdenum concentrates). Prior to 2004, when molybdenum concentrates was the nonfuel mineral leader by value, phosphate rock had led the State's nonfuel minerals since 1997; gold was first in 1996.

J.R. Simplot had an active and profitable year at its Smoky Canyon Mine, which was near the Wyoming border, and at its fertilizer plant in Pocatello in southeastern Idaho. Agrium, Inc. had been mining the Rasmussen Ridge Mine, but the company mothballed that facility and moved south to the Dry Valley Mine, which it purchased from Astaris Corp. in 2004. Agrium mined at Dry Valley for the second half of the year. Monsanto operated its South Rasmussen Mine, doing extensive concurrent reclamation with drilling and mining; the company also initiated permitting for a new project in southeastern Idaho, the Blackfoot Bridge Mine, 14 kilometers northeast of Soda Springs, Caribou County.

Other Industrial Minerals.—In northern Idaho, Emerald Creek Garnet Co. began trammel mining in the spring on its new alluvial garnet leases along the St. Maries River. Production increased at the Ash Grove Cement Co. cement facility in the southeast at Inkom; the volume of cement orders was up about 25% in the Boise Valley. Construction sand and gravel production was up, particularly in the rapidly developing urban areas near Boise, Coeur d'Alene, and parts of eastern Idaho. In far southeastern Idaho, production increased at the Bear River Zeolite Co., Inc.'s zeolite mine at Preston and at Hess Pumice Product's Wrights Creek pumice mine and plant at Malad. Hess Pumice added 50 employees and a second shift at the mine to supply a large increase in pumice needed for its new lightweight aggregate facility. Idaho Minerals Co. [a subsidiary of Hess] also opened a new plant in Malad to expand its mined crude perlite for use in potting soil.

Metals

Metal mine production in Idaho consisted mainly of molybdenum concentrates, silver, and lead (descending order of value); in comparatively lesser quantities, copper, zinc, gold, and cadmium (byproduct in zinc concentrates) (descending order of value) also were produced.

Gold.—New Jersey Mining Co., based in Kellogg, shipped its first gold concentrate from its underground Golden Chest Mine at Murray to the Barrick Goldstrike Mines Inc. facility

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in Nevada. New Jersey Mining was mining gold ore from the Katie-Dora gold-quartz vein at a rate of 400 tons per month and trucking the ore to its mill in Kellogg, which included a flotation and gravity circuit. Also, Star Materials operated a gold placer mine in Butte Gulch, near the Golden Chest, east of Murray.

Molybdenum.—Molybdenum concentrates production in Idaho took place at the Thompson Creek Mining Co.'s Thompson Creek Mine in Custer County. The molybdenum industry experienced another year of molybdenum prices that were substantially higher than the year before as Thompson Creek mined ore from phase 5 in the bottom of its large, open pit mine west of Challis, Custer County. The company purchased five new haul trucks to assist with the phase 6 stripping operation and replaced the conveyor that went from the mine to the mill.

Silver.—Almost 140,000 kg (4.5 million troy ounces) of silver was produced at the two operating mines in the Coeur d'Alene District. Silver production at Hecla Mining Co.'s Lucky Friday Mine was about 75,300 kg (2.42 million troy ounces). Hecla's employment increased to about 160 workers. Coeur d'Alene Mines Corp. operated the Coeur Silver Valley Mine (the former Galena Mine), producing nearly 64,100 kg (2.06 million troy ounces) during the year; that was somewhat less than expected owing to lower grades and shorter vein lengths in some headings.

Environmental Issues and Mine Reclamation Awards

Public concern regarding proposed gold mines near Boise that would use cyanide prompted a reexamination and strengthening of the State's regulations and cyanide permitting processes. With the claims surrounded by one of central Idaho's pristine wilderness areas, the Frank Church—River of No Return Wilderness, Thunder Mountain Gold, Inc., and the Dewey Mining Company sold the historic Dewey gold mine in the Thunder Mountain Mining District in Valley County with its patented and unpatented mining claims to the Trust for Public Lands. The Trust planned to convey the 260-hectare-property to the Payette National Forest.

Kinross DeLamar Mining Co. received the Northwest Mining Association's Environmental Excellence Award in 2005 for its reclamation work at the closed DeLamar (silver) and Stone Cabin (gold and silver) Mines in Owyhee County. Monsanto received the 2004 Environmental Excellence Award of the Idaho Association of Commerce and Industry for innovative mining and reclamation practices that reduce the likelihood of selenium leaching.

Government Programs

During 2005, the IGS released 35 new publications, most of which were made available on the IGS Web site at URL www.idahogeology.org. New geologic mapping was released for areas around Sandpoint in northern Idaho and the Twin Falls 30x60 minute quadrangle and the Blaine County regions in south-central Idaho. The mines and prospects database and many abandoned mine lands inventory reports can be accessed at the IGS Web site.

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TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN IDAHO[1, 2]

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral	2003		2004		2005	
	Quantity	Value	Quantity	Value	Quantity	Value
Gemstones	NA	477	NA	836	NA	469
Sand and gravel, construction	16,500	59,300	19,600	74,300	20,800	93,800
Stone, crushed	3,160	15,700	3,420 r	18,100 r	4,450	23,900
Combined values of cadmium (byproduct of zinc concentrates [2004-05]), cement (portland), copper, feldspar, garnet (industrial), gold (2003, 2005), lead, lime, molybdenum concentrates, perlite (crude), phosphate rock, pumice and pumicite, sand and gravel (industrial), silver, stone (dimension quartzite and sandstone), zeolites (2004-05), zinc	XX	193,000	XX	354,000	XX	788,000
Total	XX	269,000	XX	447,000 r	XX	906,000

rRevised. NA Not available. XX Not applicable.
[1]Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2]Data are rounded to three significant digits; may not add to totals shown.

TABLE 2
IDAHO: CRUSHED STONE SOLD OR USED, BY KIND[1]

Kind	2004			2005		
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Number of quarries	Quantity (thousand metric tons)	Value (thousands)
Limestone	8	404	$2,680	6	504	$3,560
Shell	1	W	W	1	W	W
Granite	10	462 r	2,540 r	10	692	3,280
Traprock	21 r	1,900 r	9,510 r	15	2,240	12,000
Quartzite	2	W	W	2	W	W
Miscellaneous stone	5 r	226 r	1,200 r	7	546	2,570
Total	XX	3,420 r	18,100 r	XX	4,450	23,900

rRevised. W Withheld to avoid disclosing company proprietary data; included in "Total." XX Not applicable.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.

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TABLE 3
IDAHO: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2005, BY USE[1]

(Thousand metric tons and thousand dollars)

Use	Quantity	Value
Construction:		
Coarse aggregate (+1½ inch):		
Riprap and jetty stone	12	73
Filter stone	W	W
Other coarse aggregate	23	139
Total	35	212
Coarse aggregate, graded:		
Bituminous aggregate, coarse	179	1,000
Bituminous surface-treatment aggregate	(2)	(2)
Railroad ballast	(2)	(2)
Total	252	1,450
Fine aggregate (-⅜ inch):		
Stone sand, bituminous mix or seal	(2)	(2)
Screening, undesignated	(2)	(2)
Total	30	175
Coarse and fine aggregates:		
Graded road base or subbase	1,540	7,510
Unpaved road surfacing	45	176
Other coarse and fine aggregates	141	820
Total	1,730	8,510
Other construction materials	(3)	1
Agricultural:		
Agricultural limestone	(2)	(2)
Poultry grit and mineral food	(2)	(2)
Total	32	855
Chemical and metallurgical:		
Cement manufacture	(2)	(2)
Flux stone	(2)	(2)
Total	635	2,660
Special:		
Mine dusting or acid water treatment	(2)	(2)
Asphalt fillers or extenders	(2)	(2)
Other fillers or extenders	(2)	(2)
Total	3	51
Other miscellaneous uses, chemicals	(4)	(4)
Unspecified:[5]		
Reported	1,280	7,530
Estimated	453	2,500
Total	1,740	10,000
Grand total	4,450	23,900

W Withheld to avoid disclosing company proprietary data; included with "Other coarse aggregate."
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Withheld to avoid disclosing company proprietary data; included in "Total."
[3]Less than ½ unit.
[4]Withheld to avoid disclosing company proprietary data; included in "Unspecified: Reported."
[5]Reported and estimated production without a breakdown by end use.

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TABLE 4
IDAHO: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2005,
BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	2,610	$13,400	$5.15
Plaster and gunite sands	32	182	5.62
Concrete products (blocks, bricks, pipe, decorative, etc.)	17	90	5.18
Asphaltic concrete aggregates and other bituminous mixtures	830	5,190	6.26
Road base and coverings[2]	5,200	22,500	4.33
Fill	1,440	4,340	3.01
Snow and ice control	134	737	5.52
Railroad ballast	463	6,970	15.08
Other miscellaneous uses	166	750	4.51
Unspecified:[3]			
Reported	3,060	11,500	3.75
Estimated	6,810	28,200	4.13
Total or average	20,800	93,800	4.52

[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.
[2]Includes road and other stabilization (cement).
[3]Reported and estimated production without a breakdown by end use.

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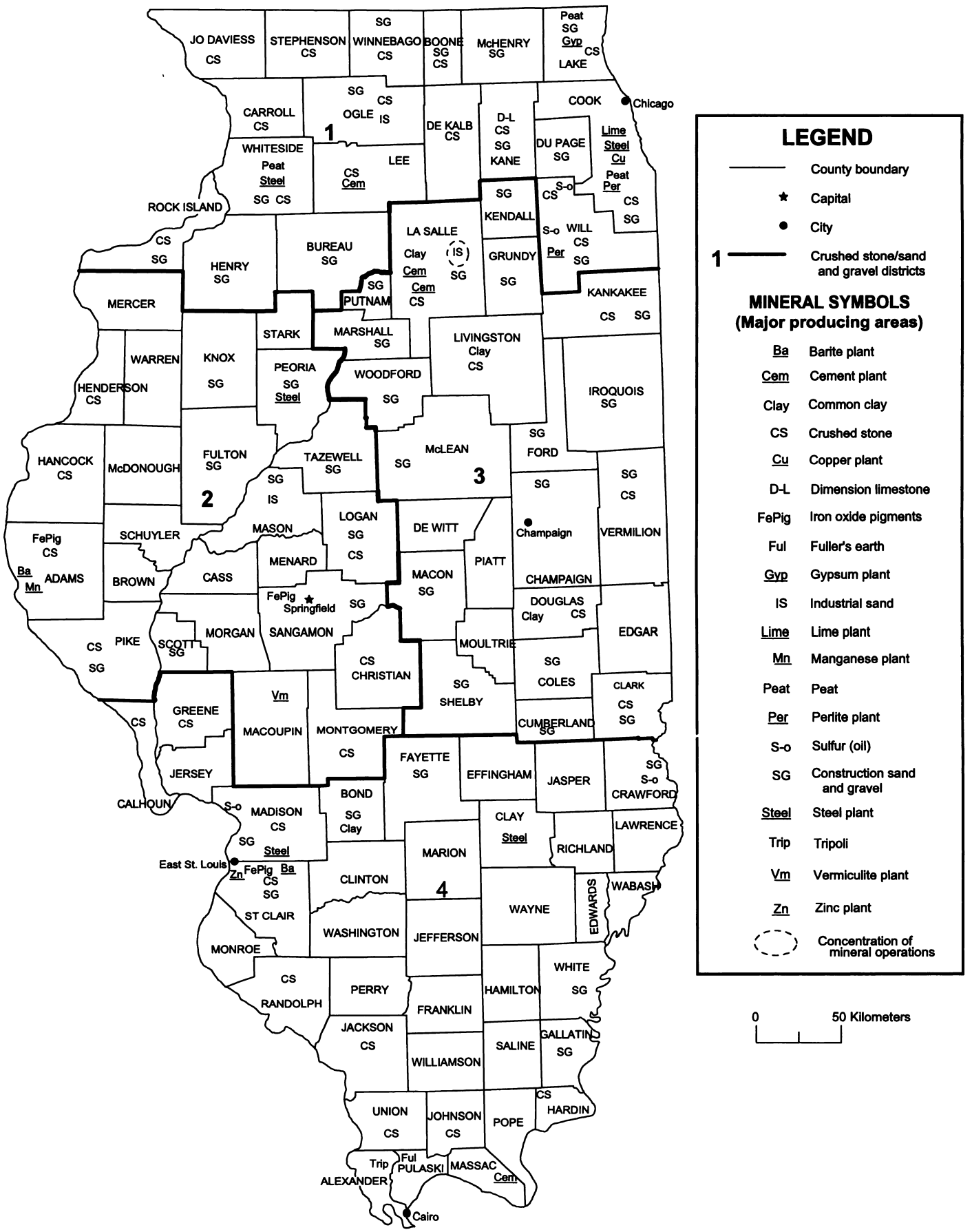
ILLINOIS



LEGEND

- County boundary
- ★ Capital
- ● City
- 1 Crushed stone/sand and gravel districts

MINERAL SYMBOLS (Major producing areas)

Ba	Barite plant
Cem	Cement plant
Clay	Common clay
CS	Crushed stone
Cu	Copper plant
D-L	Dimension limestone
FePig	Iron oxide pigments
Ful	Fuller's earth
Gyp	Gypsum plant
IS	Industrial sand
Lime	Lime plant
Mn	Manganese plant
Peat	Peat
Per	Perlite plant
S-o	Sulfur (oil)
SG	Construction sand and gravel
Steel	Steel plant
Trip	Tripoli
Vm	Vermiculite plant
Zn	Zinc plant
⬭	Concentration of mineral operations

0 50 Kilometers

Source: Illinois State Geological Survey/U.S. Geological Survey (2005)

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The Mineral Industry of Illinois

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Illinois State Geological Survey for collecting information on all nonfuel minerals.

In 2005, Illinois' nonfuel raw mineral production was valued[1] at $1.21 billion, based upon annual U.S. Geological Survey (USGS) data. This was a $160 million, or 15.2% increase from the State's total nonfuel mineral value in 2004, which then had increased by $79 million, up more than 8% from that of 2003. The State was 16th in rank (15th in 2004) among the 50 States in the total nonfuel raw mineral production value and accounted for about 2.2% of the U.S. total.

Industrial minerals continued to account for all of Illinois' nonfuel mineral production in 2005; metals were last produced in 1996, when small quantities of copper, lead, silver, and zinc were produced from mines in the State. In 2005, crushed stone, by value, remained Illinois' leading nonfuel mineral commodity, accounting for 45% of the State's total nonfuel mineral value, followed, in descending order of value, by portland cement, with more than 23%; construction sand and gravel, with more than 17%; industrial sand and gravel, with more than 8.5%; and fuller's earth, lime, and tripoli, with most of the remaining 6%. All other nonfuel minerals each accounted for less than one-half of 1% of the State's total value (table 1).

In 2005, increases in the values of crushed stone (up 18%), portland cement (up 23%), industrial sand and gravel (up 21%), and construction sand and gravel (up nearly 4%) accounted for most of the State's increase in nonfuel mineral value. The unit values of each commodity also significantly increased (table 1). Smaller increases took place in fuller's earth clay, tripoli, peat, and dimension (stone) dolomite (descending order of change).

In 2005, Illinois continued to be first in the quantities of industrial sand and gravel produced and first among 4 States that produced tripoli, fourth in the production of peat, and sixth in fuller's earth clay. While the State decreased to 7th from 5th in crushed stone, it rose to 9th from 10th in portland cement and continued to be a significant producer of construction sand and gravel and lime. Raw steel was produced in Illinois, but it was processed from ores and scrap metal obtained from other domestic and foreign sources. The State remained one of the Nation's leading raw steel-producing States with an increase in production to 4.14 million metric tons (Mt) in 2005, up from nearly 4 Mt of raw steel that was manufactured in 2004 (American Iron and Steel Institute, 2006, p. 76).

[1]The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2005 USGS mineral production data published in this chapter are those available as of December 2006. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—can be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

The following narrative information was provided by the Illinois State Geological Survey[2] (ISGS).

Commodity Review

Construction aggregate resources in Illinois primarily include, in order of decreasing abundance, dolomite, limestone, and sand and gravel. Very small amounts of skid-resistant sandstone aggregate are also produced in the southern part of the State. Sand and gravel deposits are widely distributed throughout the State, but they are most abundant and of highest quality in northeastern Illinois.

Dolomite is produced from the Silurian and Ordovician rocks of northern Illinois, especially in the Chicago area. Northeastern Illinois is one of the leading aggregate producing and consuming regions in the country and will likely remain so, long into the future. In the western and southern parts of the State, limestone of the Mississippian System is extracted for construction aggregate, cement manufacture, and other related purposes. Limited amounts of Pennsylvanian-age limestone occur in the central part of the State and are quarried where they are present near the surface. In these areas, underground mining may be necessary to meet the region's crushed-stone needs because near-surface limestone beds are thin and generally unsuited for use in concrete highways.

The year 2005 saw the continuation of two prominent trends in the Chicago-area aggregate industry. First, efforts were continued toward acquisitions of major aggregate producers in the region. The largest acquisition bid was made by Hanson plc, London, United Kingdom for Material Service Corp., the 13th-ranked producer of construction aggregates in the United States. Materials Service owns 11 stone quarries and 3 sand and gravel pits in Illinois and Indiana, including Thornton Quarry near Chicago, which is one of the largest quarries in the United States. Lafarge North America Inc., Herndon, VA, made bids to acquire several operations around the Chicago area, and in north-central Illinois. These companies included Fox River Stone Company and Joliet Sand and Gravel, along with the Conco-Western Stone Company, Utica Stone Company, Aux Sable Stone Company, and the Western Sand & Gravel Company, all of which were locally owned. If successful, these purchases would provide Lafarge with three underground aggregate mines, three quarries, and three sand and gravel operations. In another significant acquisition plan,

[2]Zak Lasemi, Geologist and Head, Industrial Minerals and Resource Economics Section, and Donald G. Mikulic, Geologist, coauthored the text of the State mineral industry information provided by the Illinois State Geological Survey.

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Aggregate Industries Ltd., Markfield, United Kingdom, initiated discussions toward the purchase of Meyer Material Company, which operates six sand and gravel operations, mainly in McHenry County, north of Chicago.

The second trend involved the depletion of near-surface aggregate reserves, coupled with an increasing difficulty in obtaining zoning and other permits for new, geologically suitable quarry sites. This has continued to affect the crushed stone and sand and gravel industries. Opposition to aggregate mining was no longer limited to populated areas. Opening of new stone quarries and sand and gravel pits or expansion of existing ones was strongly contested by citizens in many rural areas throughout the State. In partial response to this opposition, companies continued to evaluate or pursue development of underground stone mines, especially in northeastern Illinois. Several producers began to target the deeper Ordovician Galena-Platteville rocks (mainly dolomite) as a new source of aggregates at existing quarries and gravel pits. There are currently six underground mines in operation and another two under development. The two newest of these mines are in Bolingbrook and Bartlett and are owned by Vulcan Materials Company, Birmingham, AL. Most aggregates historically have been produced from Silurian-age rock quarries throughout the Chicago region.

Specific actions in opposition to aggregate mining and quarrying were noted during the year. A local environmental group continued efforts to overturn the permit approval for a new gravel mining operation in Harvard, IL, near the Wisconsin border. In an inquiry conducted as part of a suit to block the new gravel pit, the McHenry County Public Defender argued that the permit approval by the Harvard City Council was in error, citing that municipal governments do not have the expertise to consider the impact of such decisions on endangered species and preservation of natural areas (Garvey, 2005).

Despite objection from nearby residents, the Kane County Board granted the Max McGraw Wildlife Foundation a special-use permit to mine gravel and reclaim habitat on its preserve in Dundee Township. The vote by the Board to grant the permit followed a final attempt by homeowners to adjust the boundaries of the project, stating that the mining would be too close to their neighborhood (Dunphy, 2005b).

After several unsuccessful attempts to open a quarry in Ogle County, a Rockford developer appeared to have secured approval for another gravel pit near Byron. The developer had petitioned the city for a special-use permit for a 50-hectare (123-acre) gravel mine. City leaders reportedly favored the submitted plan for the mine, provided that its operation did not involve blasting (Dunphy, 2005a).

In other non-aggregate activities, Rockford Blacktop informed the city of Loves Park that it will halt mining operations at its Nimtz Road quarry in 2 or 3 years, after nearly half a century of mining. Under a 1996 annexation agreement, the city will acquire the property after mining operations end. The quarry has been mined for the limestone used in asphalt production since the early 1950s (Barbaccia, 2005).

Requests for information concerning the availability of high-purity limestone in currently operating quarries and mines, as well as its availability in other potential resources, increased significantly during the year. This form of limestone was desired for the flue-gas-desulfurization process in coal-fired powerplants. Interest has been expressed by coal companies, electric utility companies, and private consultants who are seeking a limestone product with 90% or higher calcium carbonate content. Requests for this information also were received from other States located along the Mississippi River that would benefit from the relatively low cost of transporting the limestone by barge. Several quarries and underground mines that extract high-calcium limestone operate in the western and southern part of Illinois and are conveniently located along the Mississippi and Illinois Rivers. In 2005, the ISGS, with funding from the Illinois Clean Coal Institute, completed the second phase of a project that mapped and characterized limestone resources suitable for desulfurization in coal-fired powerplants. Because of construction of new powerplants and more stringent environmental regulation, demand for high-purity limestone to use in extracting sulfur oxides from stack gases is expected to grow substantially.

Illinois' nonfuel mineral industries are expected to be faced with several challenging issues in the coming years. These include obtaining adequate government funding for continued transportation infrastructure improvements, solving the problem of supplying aggregate to the rapidly growing Chicago and Metropolitan East Saint Louis areas, and resolving the conflicting public demands for protecting the environment while continuing to produce needed resources. The repair and maintenance of the highway system require local availability of high-quality aggregate. With aggregate constituting approximately 80% of concrete pavements and more than 90% of asphalt, durable aggregate will continue to be in high demand throughout the State for years to come.

Legislation and Programs

On the national level, Illinois faired well under a new, multi-year Federal highway bill, SAFETEA-LU. Illinois received the tenth largest percentage increase and the fifth largest net increase in guaranteed Federal highway funding. Illinois will also receive approximately $662 million in additional Federal highway funding beyond these guaranteed levels for key State highway and bridge projects.

At the State level, the Illinois Association of Aggregate Producers (IAAP) briefed Illinois General Assembly leadership and key appropriations and transportation committee members concerning infrastructure issues. The importance of adequate transportation infrastructure funding and the actions necessary to restore the vitality of Illinois' road program were highlighted in a publication by the Transportation for Illinois Coalition entitled "Rough Roads Ahead." Additionally, legislation was passed to eliminate some road fund diversion, thus returning $21 million to the road fund. IAAP Environmental Committee members worked with the Illinois Environmental Protection Agency (IEPA) to develop new lifetime general operating permits for both small and large aggregate processing plants. Committee members also worked with the IEPA on National Pollutant Discharge Elimination System (NPDES) permit changes, as well as proposed regulations for operations that

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accept clean construction or demolition debris. Aggregate producers obtain NPDES permits from the IEPA to ensure that water discharged from pits and quarries does not harm the environment. Section 12.5 of the Illinois Environmental Protection Act requires aggregate producers to pay the State of Illinois a $5,000 annual fee for every NPDES discharge permit in force. Legislation was sponsored to reduce the annual NPDES fees to reasonable levels while ensuring that the State continues to receive the annual revenues necessary to implement the IEPA clean water regulatory program for aggregate mines. The Committee also developed and conducted an environmental seminar in November 2005 focusing on environmental issues of most concern to Illinois aggregate producers. Legislative committee members developed and expanded communication links with State legislative officials to promote uniform, proactive communication about aggregate issues. Members of the Public Information and Education Committee participated in a number of outreach activities, including Earth Stewardship Day, the Ninth Annual Science Teachers Workshop, the National Science Teachers Association Midwest Conference, and a number of well-attended mine tours (Illinois Association of Aggregate Producers, 2005).

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TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN ILLINOIS[1, 2]

(Thousand metric tons and thousand dollars)

Mineral	2003		2004		2005	
	Quantity	Value	Quantity	Value	Quantity	Value
Cement, portland	2,930	210,000 e	3,010	233,000 e	3,240	286,000 e
Clays:						
Common	179	1,010	247	1,390	119	667
Fuller's earth	W	W	218	W	225	W
Gemstones	NA	28	NA	70	NA	14
Sand and gravel:						
Construction	34,600	161,000	38,700	203,000	37,400	210,000
Industrial	4,440	72,600	4,950	86,200	5,510	104,000
Stone, crushed	76,000 [3]	453,000 [3]	75,300 r	462,000 r	76,200	545,000
Combined values of lime, peat, stone [crushed sandstone (2003), dimension dolomite (2005)], tripoli, and values indicated by symbol W	XX	74,000	XX	65,000 r	XX	64,500
Total	XX	971,000	XX	1,050,000 r	XX	1,210,000

eEstimated. rRevised. NA Not available. W Withheld to avoid disclosing company proprietary data. Withheld values included in "Combined values" data. XX Not applicable.

[1]Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

[2]Data are rounded to three significant digits; may not add to totals shown.

[3]Excludes certain stones; kind and value included with "Combined values" data.

TABLE 2
ILLINOIS: CRUSHED STONE SOLD OR USED, BY KIND[1]

Kind	2004			2005		
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Number of quarries	Quantity (thousand metric tons)	Value (thousands)
Limestone[2]	110 r	56,500 r	$343,000 r	108	56,600	$400,000
Dolomite	17 r	18,700 r	118,000 r	14	19,500	144,000
Sandstone	1	73	353	2	125	1,200
Total	XX	75,300 r	462,000 r	XX	76,200	545,000

rRevised. XX Not applicable.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes limestone-dolomite reported with no distinction between the two.

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TABLE 3
ILLINOIS: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2005, BY USE[1]

(Thousand metric tons and thousand dollars)

Use	Quantity	Value
Construction:		
Coarse aggregate (+1½ inch):		
Macadam	2,420	17,800
Riprap and jetty stone	1,820	20,200
Filter stone	1,900	15,200
Other coarse aggregate	284	2,510
Total	6,420	55,700
Coarse aggregate, graded:		
Concrete aggregate, coarse	9,900	79,500
Bituminous aggregate, coarse	5,610	48,700
Bituminous surface-treatment aggregate	2,280	19,200
Railroad ballast	665	4,780
Other graded coarse aggregate	2,160	15,100
Total	20,600	167,000
Fine aggregate (-⅜ inch):		
Stone sand, concrete	2,140	11,400
Stone sand, bituminous mix or seal	1,870	8,780
Screening, undesignated	1,080	5,250
Other fine aggregate	303	1,680
Total	5,400	27,100
Coarse and fine aggregates:		
Graded road base or subbase	11,800	62,200
Unpaved road surfacing	1,540	8,890
Crusher run or fill or waste	1,650	9,320
Other coarse and fine aggregates	2,000	10,800
Total or average	17,000	91,200
Other construction materials	57	100
Agricultural:		
Limestone	2,350	7,660
Poultry grit and mineral food	W	W
Other agricultural uses	69	833
Total	2,420	8,490
Chemical and metallurgical:		
Cement manufacture	2,560	19,800
Dead burned dolomite	(2)	(2)
Flux stone	(2)	(2)
Total	3,350	24,200
Special:		
Mine dusting or acid water treatment	(2)	(2)
Asphalt fillers or extenders	(2)	(2)
Other fillers or extenders	(2)	(2)
Total	1,670	36,700
Other miscellaneous uses and specified uses not listed	2	55
Unspecified:[3]		
Reported	6,890	49,400
Estimated	12,000	85,000
Total	19,300	135,000
Grand total	76,200	545,000

W Withheld to avoid disclosing company proprietary data; included with "Other agricultural uses."

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Withheld to avoid disclosing company proprietary data; included in "Total."

[3]Reported and estimated production without a breakdown by end use.

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TABLE 4
ILLINOIS: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2005, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3		District 4	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Construction:								
Coarse aggregate (+1½ inch)[2]	4,870	42,300	W	W	W	W	W	W
Coarse aggregate, graded[3]	13,700	114,000	W	W	W	W	W	W
Fine aggregate (-⅜ inch)[4]	4,060	20,700	W	W	W	W	W	W
Coarse and fine aggregates[5]	11,000	59,300	W	W	W	W	2,090	11,400
Other construction materials	57	100	--	--	--	--	--	--
Agricultural[6]	W	W	W	W	W	W	W	W
Chemical and metallurgical[7]	W	W	--	--	W	W	--	--
Special[8]	W	W	W	W	W	W	--	--
Other miscellaneous uses and specified uses not listed	2	56	--	--	--	--	--	--
Unspecified:[9]								
Reported	1,690	11,600	--	--	1,430	10,700	3,770	27,000
Estimated	3,100	22,000	1,900	13,000	2,900	20,000	4,400	31,000
Total	41,800	289,000	5,270	56,400	14,300	100,000	14,900	99,600

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes filter stone, macadam, riprap and jetty stone, and other coarse aggregates.

[3]Includes bituminous aggregate (coarse), bituminous surface-treatment aggregate, concrete aggregate (coarse), railroad ballast, and other graded aggregates.

[4]Includes stone sand (bituminous mix or seal), stone sand (concrete), screening (undesignated), and other fine aggregates.

[5]Includes crusher run or fill or waste, graded road base or subbase, unpaved road surfacing, and other coarse and fine aggregates.

[6]Includes agricultural limestone, poultry grit and mineral food, and other agricultural uses.

[7]Includes cement manufacture, dead burned dolomite, and flux stone.

[8]Includes asphalt fillers or extenders, mine dusting or acid water treatment, and other fillers or extenders.

[9]Reported and estimated production without a breakdown by end use.

TABLE 5
ILLINOIS: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2005,
BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	14,200	$79,200	$5.60
Plaster and gunite sands	340	1,410	4.16
Concrete products (blocks, bricks, pipe, decorative, etc.)	455	1,870	4.11
Asphaltic concrete aggregates and other bituminous mixtures	3,340	21,300	6.38
Road base and coverings	5,170	35,300	6.82
Road and other stabilization (cement and lime)	175	1,350	7.70
Fill	2,330	9,940	4.27
Snow and ice control	64	413	6.43
Other miscellaneous uses[2]	59	516	8.81
Unspecified:[3]			
Reported	4,600	22,400	4.87
Estimated	6,750	36,100	5.34
Total or average	37,400	210,000	5.60

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes filtration and roofing granules.

[3]Reported and estimated production without a breakdown by end use.

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TABLE 6
ILLINOIS: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2005, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products[2]	7,710	42,800	1,180	5,610	4,670	28,400
Asphaltic concrete aggregates and other bituminous mixtures	997	4,890	158	557	W	W
Road base and coverings[3]	2,800	20,600	561	3,130	1,550	10,500
Fill	1,270	6,530	339	1,080	465	1,490
Snow and ice control	W	W	W	W	7	50
Other miscellaneous uses[4]	46	342	34	216	2,160	15,800
Unspecified:[5]						
Reported	2,410	11,700	54	287	2,140	10,400
Estimated	3,170	17,100	1,190	6,200	1,660	8,860
Total	18,400	104,000	3,520	17,100	12,600	75,500

Use	District 4		Unspecified district	
	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products[2]	1,050	4,990	327	722
Asphaltic concrete aggregates and other bituminous mixtures	W	W	--	--
Road base and coverings[3]	429	2,420	--	--
Fill	255	838	--	--
Snow and ice control	--	--	--	--
Other miscellaneous uses[4]	69	416	--	--
Unspecified:[5]				
Reported	--	--	--	--
Estimated	730	3,900	--	--
Total	2,540	12,600	327	722

W Withheld to avoid disclosing company proprietary data; included in "Other miscellaneous uses." -- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes plaster and gunite sands.

[3]Includes road and other stabilization (cement and lime).

[4]Includes filtration and roofing granules.

[5]Reported and estimated production without a breakdown by end use.

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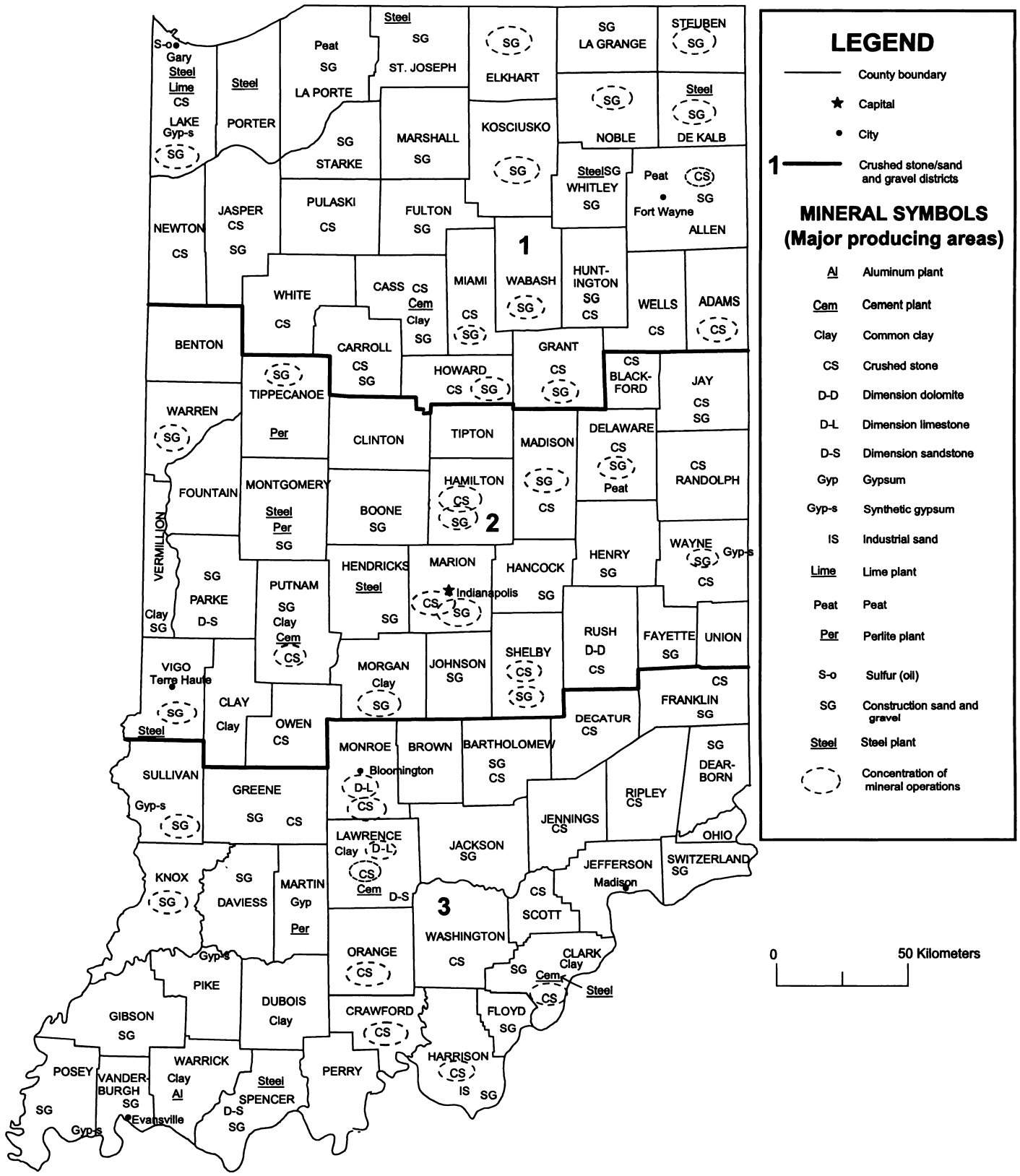

Source: Indiana Geological Survey/U.S. Geological Survey (2005)

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THE MINERAL INDUSTRY OF INDIANA

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Indiana Geological Survey for collecting information on all nonfuel minerals.

In 2005, Indiana's nonfuel raw mineral production was valued[1] at $883 million, based upon annual U.S. Geological Survey (USGS) data. This was a nearly 13.8% increase of $107 million from that of 2004, which was up about 8.4% from 2003 to 2004. The State remained 22d in rank among the 50 States in total nonfuel raw mineral production value, of which Indiana accounted for about 1.6% of the U.S. total.

In 2005, crushed stone, by value, regained the lead amongst the State's nonfuel mineral commodities, followed by cement (portland and masonry), construction sand and gravel, lime, and dimension stone. (For more than a decade prior to 2003 and 2004 when cement led the State's nonfuel minerals, crushed stone had been the State's leading nonfuel mineral commodity.) The combined values of these five mineral commodities accounted for more than 97% of the State's total nonfuel mineral value. Although only small increases took place in the quantities of crushed stone and construction sand and gravel that were produced, and while portland cement production was down slightly, increases in the values of crushed stone (up $46 million), portland cement (up $25 million), and construction sand and gravel (up $19 million) accounted for most of the State's increase in total nonfuel mineral production value in 2005. Smaller yet significant increases took place in the values of dimension stone and gypsum (descending order of value) (table 1).

In 2005, Indiana continued to be fifth in the quantity of ball clay produced as compared with other producing States and was a leading masonry cement-producing State. The State's aggregate mining companies produced substantial quantities of crushed stone and construction sand and gravel, Indiana remaining 12th and 15th in rank, respectively; additionally, substantial quantities of common clays were produced in the State. With only slight decreases in the production of each commodity, except in that of gypsum (production up, slightly), Indiana decreased to 3d from 1st in the production of dimension stone, to 8th from 7th in gypsum, to 9th from 8th in lime, and to 10th from 9th in portland cement.

The State's mines produced exclusively industrial minerals and coal; all raw steel and primary aluminum produced in the State were processed from materials received from foreign and other domestic sources. Indiana continued to lead the Nation in the production of raw steel, with an estimated output of about 22.4 million metric tons (Mt) of raw steel, down about 9.7% from 24.8 Mt that were produced in 2004, as reported by the American Iron and Steel Institute (American Iron and Steel Institute, 2006, p. 76). Based upon USGS annual data, the State continued as the second-leading primary aluminum-producing State.

The following narrative information was provided by the Indiana Geological Survey[2] (IGS).

Employment

Approximately 3,630 individuals were employed in Indiana's nonfuel minerals sector during 2005; this represented an increase of about 1.8% from 2004 employment figures, according to the U.S. Department of Labor's Mine Safety and Health Administration.

Commodity Review

Industrial Minerals

Clay and Shale.—Boral Limited, Australia's major building and construction materials supplier, planned the construction of a new $55 million brick plant to be built in Terre Haute in Vigo County. As part of Boral Bricks Inc., the company's U.S. brick-producing subsidiary, the plant capacity was planned to be up to 120 million clay bricks per year in various sizes and colors, about 8% of the company's production in the United States. Boral expected operation at the new plant to begin by the end of 2007.

Construction Sand and Gravel.—Several companies began new sand and gravel operations during 2005, including; Bottamiller Enterprises, Inc. at its Power Screen operation, in Hamilton County; Carey Realty Co., Inc. in Kosciusko County; Julian Earthwork, Inc. at the Portable Plant #2 in Steuben County; U.S. Aggregates, Inc. at its Perkinsville Plant in Hamilton County; and Yellow Creek Gravel Service in Elkhart County. Pit closures were reported at Brookfield Sand & Gravel, Inc. in Darlington, Marion County; Darlington Sand & Gravel, LLC in Montgomery County; J & R Stone in Steuben County; Salts Sand & Gravel in Warren County; St. Joseph Materials' Plant #5 in St. Joseph County; U.S. Aggregates, Inc.'s Noblesville Plant #2 in Hamilton County; and W. W. Gravel Company, Inc.'s Roanoke Plant in Whitley County.

Regarding changes in company ownership, W.W. Gravel Co., Inc. sold its remaining plants to Speedway Sand & Gravel, Inc., which included the Columbia City Plant in Whitley County, the Disko Plant in Wabash County, and the Lancaster Plant in Huntington County. Critser Companies, Inc. sold several plants to Vulcan Materials Co. including Bass Lake Sand & Gravel in Starke County, Eagle Creek Sand & Gravel in Lake County, Hanna Sand & Gravel, Co. Inc. in LaPorte County, and Northern

[1]The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2005 USGS mineral production data published in this chapter are those available as of December 2006. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—can be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

[2]Kathryn R. Shaffer, Minerals Statistician, authored the text of State mineral industry information provided by the Indiana Geological Survey.

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Indiana Materials Corp., a crushed stone operation in Lake County. Bethlehem Sand & Gravel Co., LLC sold its Bethlehem Plant 1 in Clark County to Brooks Sand & Gravel, LLC. U.S. Aggregates purchased Stonehenge Concrete Co., Inc.'s Modoc Plant, a sand and gravel operation in Randolph County, but the plant was not in operation at yearend. Stonehenge Concrete Co., Inc. had been in existence for 20 years. Switzerland-based Holcim Ltd. acquired United Kingdom-based Aggregate Industries Ltd., which operated three pits in Indiana in Elkhart County.

Crushed Stone.—In 2005, several new mines opened, expanded, or improved operations and several acquisitions and closures took place. One of the new operations was Rock Creek Materials, LLC's crushed stone operation in Wells County. Hanson Building Materials America, Inc. planned the expansion of its Fort Wayne quarry in Allen County for an additional 50 hectares (ha) (120 acres). Rogers Group, Inc. added a 5-kilometer (3-mile) railroad spur to connect its Bloomington Crushed Stone Co. limestone quarry in Monroe County to the Indiana Rail Road Co.'s Ellettsville line. Owing to this, Rogers Group expected to increase sales of scrubber stone and specialty products and to have a reduction in truck traffic, improving safety overall. Oglebay Norton Co. unified its limestone and lime operations under the name of O-N Minerals. In Indiana, this affected the company's Global Stone Portage, LLC operation in Porter County, changing its name to O-N Minerals (Portage) Company LLC. Watson Gravel, Inc. purchased Parker Brothers Stone Co. in Putnam County, but the company will do business as Parker Stone Co., LLC.

Liter's Quarry, Inc.'s three Indiana mines—Atkins and Cooper Lane Mine, both producing crushed stone in Clark County, and Tom Miller Mine, an underground crushed stone mine in Scott County—were sold to Hanson Building Materials; closure of the Tom Miller Mine was considered to be possible.

Dimension Stone.—While limestone and, less so, dolomite are Indiana's predominant dimension stone products, some dimension sandstone is also produced in Brown, Parke, and Spencer Counties.

Audax Group acquired Victor Oolitic Stone Co., which has been in production since 1898 (CNET Networks, Inc.. 2005§[3]). A request to rezone land south of Bloomington in Monroe County to residential use was studied but denied by the area zoning authority because it would have prevented dimension limestone resources that were present there from ever being developed. Victor Oolitic Stone previously had attempted to sell the property, but the Indiana Limestone Company, which held neighboring reserves, was concerned that development of that property would prevent future use of those reserves that it might someday wish to develop.

As part of the Indiana Limestone Heritage Parks Project, limestone trails and a park were in the planning and development stages. As completed, driving tours and walking tours were planned to be part of a "general limestone experience" accessible from the recently renovated Lawrence County History and Genealogy Museum in Lawrence, Bedford County, or the old Woolery Stone Mill in Bloomington, Monroe County. The Woolery Stone Mill was undergoing renovation into a convention center with a hotel, pub, and restaurant, and additionally, condominiums. Neighboring areas, as well as some other locations, were under consideration for the park (Goss and Owens, 2005§).

Metals

Aluminum.—Alcoa, Inc. announced that it would invest $330 million into its Warrick powerplant at Newburgh to increase environmental performance, to increase power efficiency, to lower costs, and to further secure long-term, low-cost power for its smelter at its Alcoa Warrick Operations and related downstream business there. An additional $68 million was to be invested by Vectren Corp., part owner of the powerplant. Wet limestone scrubbers were planned for installation on all four operating units; also planned were the installation of new coal-handling facilities and boiler modifications to allow for the burning of natural gas if needed. At completion, expected by about 2010, sulfur dioxide emissions are anticipated to decrease by 98% and wastewater reduced by 30,300 cubic meters (8 million gallons). The company was also planning to invest another $45 million to set up a coal mining operation in Friendsville, IL, and to acquire needed equipment. This coal would be transported by railcar to the smelter's powerplant (Alcoa, Inc., 2005§).

Steel.—Company mergers continued in the steel industry. International Steel Group (ISG) merged with Mittal Steel Co., LLC to become the largest steel producer in the world with operations in 14 countries. Steel mills at Burns Harbor, East Chicago, and ISG Railroads were acquired in the transaction. The U.S. holdings of the company were named Mittal Steel USA. Two large integrated steel plants in East Chicago (IN), the Ispat Inland mill, acquired from Ispat International in 2004, and ISG Indiana Harbor Works were combined under one name, Indiana Harbor. With the two neighboring mills being separated only by the Indiana Harbor Canal, they were considered by the company to be one plant, by that understanding making Indiana Harbor the Nation's highest producing raw-steelmaking location. The capacity of the combined plant, which encompassed 1,250 ha (3,090 acres), was slightly more than 9 million metric tons per year of sheet steel products (American Metal Market, 2005§). However, with a slowdown in the market during 2005, Indiana Harbor idled its blast furnaces, H-3 at the former ISG Indiana Harbor Works plant and No. 6 at the former Ispat Inland plant, to do some maintenance while reducing the amount of steel on the market. Two furnaces were left running, with restart of the idled furnaces depending on the market. The company kept another former Ispat Inland furnace running to fill orders. Indiana Harbor expected to save more than $230 million annually in purchasing, manufacturing, and operating expenses, and more than $60 million in one-time improvements. The company also planned to close its research facility in Pennsylvania with positions to be moved to the company's East Chicago research center; this would expand that center by 40% and make it the largest one operated by Mittal Steel and one of the largest in the Nation. In other company information, Mittal Steel USA's Burns Harbor Plate operation successfully restarted

[3]References that include a section mark (§) are found in the Internet References Cited section.

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its 279-centimeter (110-inch) plate mill because of an increase in demand for plated steel; it had been idled since August 2000.

Steel Dynamics, Inc., a 9-year old company, ranked fourth nationally among steel companies in capacity. The company purchased land from a neighbor to its DeKalb County plant, with the intent of building an ironmaking facility, Indiana Nugget, which would utilize a cleaner process that does not use coke, but permit problems slowed progress on that project. Steel Dynamics sold land to Heidtman Steel Products, Inc., upon which Heidtman is constructing a mill utilizing unique processing equipment to produce sheet products for truck manufacturers with Steel Dynamics supplying the coils. Steel Dynamics had under consideration the building of a $200 million rolling mill at its Columbia City mill in Whitley County. The company was building an $18 million expansion to its Bar Products mill in Pittsboro to add needed processes and additional services for its customers; the facility was to be completed in March 2006 and begin operation that spring.

ForeverGreen Enterprises, Inc., a company with the technology to produce hydrogen from the recycling of wastes such as household hazardous wastes, paints, and solvents planned to build a recycling plant in DeKalb County near Steel Dynamics, which uses hydrogen in its process. Through the process of plasma-induced molecular dissociation, ForeverGreen is able to break down waste materials into basic elements to extract hydrogen, as well as carbon, which can be recycled, all with no emissions released back into the environment. In an area where a high demand for hydrogen already exists, the company anticipated through its planned production capabilities to induce the development of a hydrogen business cluster in the surrounding area (Indiana Development Corp., 2005§).

U.S. Steel Corp.'s Gary Works plant was the company's highest producing raw-steelmaking facility. U.S. Steel was rebuilding the plant's primary blast furnace, No. 13, the second largest furnace in the country; the downtime for construction reduced the quantity of flat-rolled steel produced there in 2005. The unit has had carbon monoxide problems, which previously had resulted in injury as well as death. Many technological features were to be added to the furnace after which it was to be renamed No. 14; production was expected to be greatly improved. About 45% of the iron produced at Gary Works in recent years has been produced in the No. 13 furnace. Work on the furnace was hampered by a variety of problems but was expected to be completed by early 2006 with the life expectancy of the repaired furnace being at least 20 years. The coke battery at the mill closed in October because of a company decision that it was no longer needed. Less than 25% of the coke used at Gary Works came from the plant and coke will be brought to the mill from other U.S. Steel plants. Also, the company intended to begin buying back its common stock when financial conditions became favorable.

Ambassador Steel Corp. and Nucor Corp. were in the process of entering into a joint venture to form Nufab Rebar, LLC to fabricate rebar. A steel strapping company was planned to be built near Nucor Corp.'s Crawfordsville plant, in part to reduce transportation costs. The company was to cut straps from Nucor's steel coils and also provide straps to Nucor.

Environmental Issues and Awards

A portion of the Lake Michigan shoreline has long been dominated by steel mills. A project called the "Marquette Plan" was in the early stages of addressing the redevelopment of much of the shoreline, making approximately 80% of it between Hammond and Portage accessible to the public. More land, largely held by steel companies, may become available, owing to company mergers and operation consolidations; with an improved shoreline, commercial development of the area was expected to follow. Greenways (park/bicycle/walkways) were also included in the plan.

At Buzzi Unicem USA's Greencastle cement plant, an 89% decrease in sulfur dioxide emissions and a 38% decrease in nitrogen oxide emissions took place, as well as reductions in particulate matter and other emissions since its innovative semidry kiln line technology was installed in 2000. The company received an Indiana Governor's Environmental Excellence Award in 2005 for the improvements.

Hanson Building Materials' Versailles Quarry in Ripley County received a Showplace Award in National Stone, Sand and Gravel Association's (NSSGA's) annual About Face competition, the awards of which are presented to aggregate operations for beautification efforts. Rogers Group, Inc.'s Sieboldt Quarry in Lawrence County won a Safety Achievement Award for medium-sized operations in the NSSGA Sterling Safety Awards program. Rogers Group, Inc. Bloomington earned an Excellence Award as part of the NSSGA community relations awards.

Two of Rogers Group, Inc.'s Indiana operations received recognition in the NSSAG's About Face Awards program. The company's Greene County Plant near Bloomfield received an Outstanding Achievement Award and its Graysville Sand and Gravel operation received a First Step Award. Also, Rogers Group's Morgan County Sand and Gravel earned a Certificate of Achievement as part of the NSSGA community relations awards.

The U.S. Environmental Protection Agency (EPA) fined Lehigh Cement Co. $40,000 for excessive emissions of carbon monoxide at its Mitchell plant. The company will also be required to retest for carbon monoxide and nitrogen oxide emission levels and then file for a modification of its air permit reflecting those findings. The incident took place in 2003 when the company temporarily modified two kilns. Because it was a temporary problem related to that modification, the EPA took that into consideration when determining the fine. The system change allowed the plant to increase its cement production. The EPA also issued a six-count notice of violation to the company for airborne emissions during 2005.

Legislation and Government Programs

The much anticipated Federal highway transportation bill renewal, entitled The Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU) was enacted August 10, 2005, as Public Law 109-59. Under that Federal law, Indiana was alloted $5.3 billion of the

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$286.4 billion for State highway projects. Indiana's share of the funds increased by 34.7%, more than that of the previous transportation bill and was the eighth largest increase for a State. At least $400 million was allotted to Highway 69 (I-69) for affected States, including Indiana, to share. Included in the bill was $58 million for two bridges over the Ohio River in the Jeffersonville, IN, area.

State legislation passed establishing a new agency, the Indiana Economic Development Corporation (IEDC) an economic development agency to replace the Indiana Department of Commerce. The primary purpose of the IEDC, organized as a public-private partnership, was to concentrate efforts on the creation of businesses and jobs in the State. The agency was to be controlled by the State Governor and 11 board members.

Indiana legislators passed IC 36-7.5 Article 7.5 creating the Northwest Indiana Regional Development Authority, charged with further developing the Lake Michigan lakeshore and making transportation improvements in the area. Included in the legislation was a plan to build a new $550 million to $700 million stadium in Indianapolis for the Indianapolis Colts professional football team. There were also plans to renovate the nearby convention center, bringing that project's total estimated cost to about $990 million. Lake County's portion was most likely to be funded by area casinos, a tax on food and beverage, and Indiana toll road income. Funding for needed improvements at the Gary/Chicago Airport was given support from Porter County when it passed an increase in its local income tax to help in the funding of the plan; Porter County planned to review the project in 2 years to examine its progress. The Indianapolis portion could be funded by new taxes that would be imposed on athlete salaries, car rentals, hotels, restaurants, and tickets.

The Indiana Department of Transportation (INDOT) formulated a statewide 10-year plan, with input from legislators, to prioritize about 250 highway projects which include $5.3 billion for new road construction. Under a proposal called Major Moves for Indiana, an increase in tolls on the Indiana toll road and possibly some funding resulting from the building of additional toll roads would be used for maintenance and other projects under a public-private relationship, the State's toll roads being leased to a private company. This plan would generate additional funds for other highway projects and speed up construction of I-69 by several years. The plan needed approval from the Indiana legislature. Plans progressed for the proposed I-69 extension between Indianapolis and Evansville, and possible intersections were discussed at public meetings. Several other multimillion-dollar highway construction plans were planned by INDOT during the year.

The city of Carmel in Hamilton County enacted a new ordinance to control mining practices that exerted more control over blasting practices in the city. A city mining ordinance passed earlier in the year was withdrawn as a result of a lawsuit filed by Martin Marietta Aggregates Inc., which has a sand and gravel operation in the city. The city has enacted mining ordinances to prevent expansion of the operation for many years but has had to repeatedly withdraw them owing to lawsuits filed by Martin Marietta. Amendments were made to Morgan County's mining ordinance that, while still protecting the public, eased some of the burden placed on mining companies by the original law. Monroe County Commissioners altered the county zoning ordinance to make rock crushers for approved quarries a conditional use rather than an accessory use. That Commission also established a 5-year community plan for the Stinesville area that will keep most further development downtown, owing to extensive limestone quarries in the area and limestone deposits that could be quarried nearby in the future.

Vincennes University is presenting compliance training for the mining industry in Indiana. In addition, a mining degree program was under development at the 2-year university. This program was planned to be of help and benefit to both the State's coal and its nonfuel mineral mining industries, each having experienced a shortage of miners in recent years.

More than 50,000 high-resolution digital aerial photos of the entire State were taken to update Indiana's geographic information systems (GIS). The IGS published Miscellaneous Map 71, Geologic Map of Glacial and Post-glacial Deposits, Northern Lake County, Indiana, scale 1:40,000, 2 sheets (Brown and Thompson, 2005); and Circular 12, Gold and Diamonds—An Update with added historical facts (Hill, 2005). Additionally, the IGS was in the process of publishing a new Directory of Industrial Mineral Producers in Indiana (Shaffer, 2006).

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TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN INDIANA[1, 2]

(Thousand metric tons and thousand dollars)

Mineral	2003		2004		2005	
	Quantity	Value	Quantity	Value	Quantity	Value
Cement, portland	2,930	203,000 e	3,080	218,000 e	3,060	243,000 e
Clays, common	385	767	729	1,890	809	13,500
Gemstones	NA	4	NA	4	NA	4
Sand and gravel, construction	32,900	129,000	28,300	116,000	28,400	135,000
Stone:						
Crushed	50,500	237,000	56,800	265,000 r	57,500	311,000
Dimension	242	42,100	251	45,500	240	46,300
Combined values of cement (masonry), clays (ball), gypsum (crude), lime, peat, sand and gravel (industrial)	XX	104,000	XX	129,000 r	XX	135,000
Total	XX	716,000	XX	776,000 r	XX	883,000

eEstimated. rRevised. NA Not available. XX Not applicable.
[1]Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2]Data are rounded to three significant digits; may not add to totals shown.

TABLE 2
INDIANA: CRUSHED STONE SOLD OR USED, BY KIND[1]

Kind	2004			2005		
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Number of quarries	Quantity (thousand metric tons)	Value (thousands)
Limestone[2]	74	48,900	$224,000 r	70	47,700	$250,000
Dolomite	18	7,900	41,600	18	9,750	60,200
Total	XX	56,800	265,000 r	XX	57,500	311,000

rRevised. XX Not applicable.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes limestone-dolomite reported with no distinction between the two.

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TABLE 3
INDIANA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2005, BY USE[1]

(Thousand metric tons and thousand dollars)

Use	Quantity	Value
Construction:		
Coarse aggregate (+1½ inch):		
Macadam	246	1,370
Riprap and jetty stone	644	4,580
Filter stone	117	709
Other coarse aggregates	1,370	4,900
Total	2,380	11,600
Coarse aggregate, graded:		
Concrete aggregate, coarse	3,000	17,600
Bituminous aggregate, coarse	1,880	12,400
Bituminous surface-treatment aggregate	1,460	10,800
Railroad ballast	637	3,660
Other graded coarse aggregates	3,250	12,500
Total	10,200	57,000
Fine aggregate (-⅜ inch):		
Stone sand, concrete	W	W
Stone sand, bituminous mix or seal	341	2,020
Screening, undesignated	189	775
Other fine aggregates	2,500	8,760
Total	3,030	11,600
Coarse and fine aggregates:		
Graded road base or subbase	6,700	40,100
Unpaved road surfacing	3,460	22,200
Terrazzo and exposed aggregate	(2)	(2)
Crusher run or fill or waste	602	3,420
Other coarse and fine aggregates	4,210	23,300
Total	15,000	89,000
Other construction materials[3]	16	105
Agricultural:		
Limestone	1,140	5,280
Poultry grit and mineral food	(4)	(4)
Other agricultural uses	(4)	(4)
Total	1,660	7,340
Chemical and metallurgical:		
Cement manufacture	(4)	(4)
Flux stone	(4)	(4)
Sulfur oxide removal	(4)	(4)
Total	4,640	13,600
Special, whiting or whiting substitute	(5)	(5)
Other miscellaneous uses and specified uses not listed	2	8
Unspecified:[6]		
Reported	15,800	88,000
Estimated	4,800	24,000
Total	20,600	112,000
Grand total	57,500	311,000

W Withheld to avoid disclosing company proprietary data; included with "Other fine aggregate."
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Withheld to avoid disclosing company proprietary data; included with "Other coarse and fine aggregates."
[3]Includes pipe bedding.
[4]Withheld to avoid disclosing company proprietary data; included in "Total."
[5]Withheld to avoid disclosing company proprietary data; included with "Unspecified: Reported."
[6]Reported and estimated production without a breakdown by end use.

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TABLE 4

INDIANA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2005, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Construction:						
Coarse aggregate (+1½ inch)[2]	W	W	W	W	1,720	7,050
Coarse aggregate, graded[3]	3,220	20,000	2,040	13,800	4,960	23,200
Fine aggregate (-⅜ inch)[4]	W	W	W	W	2,460	8,430
Coarse and fine aggregates[5]	6,780	41,600	W	W	W	W
Other construction materials[6]	3	24	13	80	(7)	2
Agricultural[8]	W	W	W	W	W	W
Chemical and metallurgical[9]	W	W	--	--	W	W
Special[10]	--	--	--	--	W	W
Other miscellaneous uses	--	--	1	3	1	5
Unspecified:[11]						
Reported	1,570	9,720	11,600	72,700	2,650	13,500
Estimated	1,300	6,600	1,200	6,300	2,300	12,000
Total	15,100	88,400	17,700	111,000	24,600	112,000

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes filter stone, macadam, riprap and jetty stone, and other coarse aggregates.

[3]Includes bituminous aggregate (coarse), bituminous surface-treatment aggregate, concrete aggregate (coarse), railroad ballast, and other graded coarse aggregates.

[4]Includes stone sand (bituminous mix or seal), stone sand (concrete), screening (undesignated), and other fine aggregates.

[5]Includes crusher run or fill or waste, graded road base or subbase, terrazzo and exposed aggregate, unpaved road surfacing, and other coarse and fine aggregates.

[6]Includes pipe bedding.

[7]Less than ½ unit.

[8]Includes agricultural limestone, poultry grit and mineral food, and other agricultural uses.

[9]Includes cement manufacture, flux stone, and sulfur oxide removal.

[10]Includes whiting or whiting substitute.

[11]Reported and estimated production without a breakdown by end use.

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TABLE 5
INDIANA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2005, BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	9,810	$46,200	$4.71
Plaster and gunite sands	27	305	11.39
Concrete products (blocks, bricks, pipe, decorative, etc.)	247	1,520	6.18
Asphaltic concrete aggregates and other bituminous mixtures	2,170	11,900	5.49
Road base and coverings	1,220	6,780	5.55
Road and other stabilization (cement and lime)	90	422	4.67
Fill	3,540	15,200	4.29
Snow and ice control	566	1,850	3.27
Other miscellaneous uses[2]	304	1,830	6.02
Unspecified:[3]			
Reported	5,190	25,200	4.86
Estimated	5,250	24,100	4.59
Total or average	28,400	135,000	4.76

[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.
[2]Includes filtration.
[3]Reported and estimated production without a breakdown by end use.

TABLE 6
INDIANA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2005, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate (including concrete sand)	2,750	10,600	3,640	17,500	3,420	18,000
Concrete products (blocks, bricks, pipe, decorative, etc.)[2]	30	255	124	872	120	701
Asphaltic concrete aggregates and other bituminous mixtures	609	3,090	1,050	5,810	518	3,020
Road base and coverings[3]	459	2,700	694	3,420	160	1,090
Fill	774	2,530	2,530	11,600	233	1,020
Snow and ice control	89	259	W	W	W	W
Other miscellaneous uses[4]	88	343	483	1,790	210	1,290
Unspecified:[5]						
Reported	659	3,130	4,440	21,500	93	593
Estimated	1,450	6,730	1,490	6,760	2,320	10,600
Total	6,910	29,700	14,400	69,300	7,070	36,300

W Withheld to avoid disclosing company proprietary data; included in "Other miscellaneous uses."
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes plaster and gunite sands.
[3]Includes road and other stabilization (cement and lime).
[4]Includes filtration.
[5]Reported and estimated production without a breakdown by end use.

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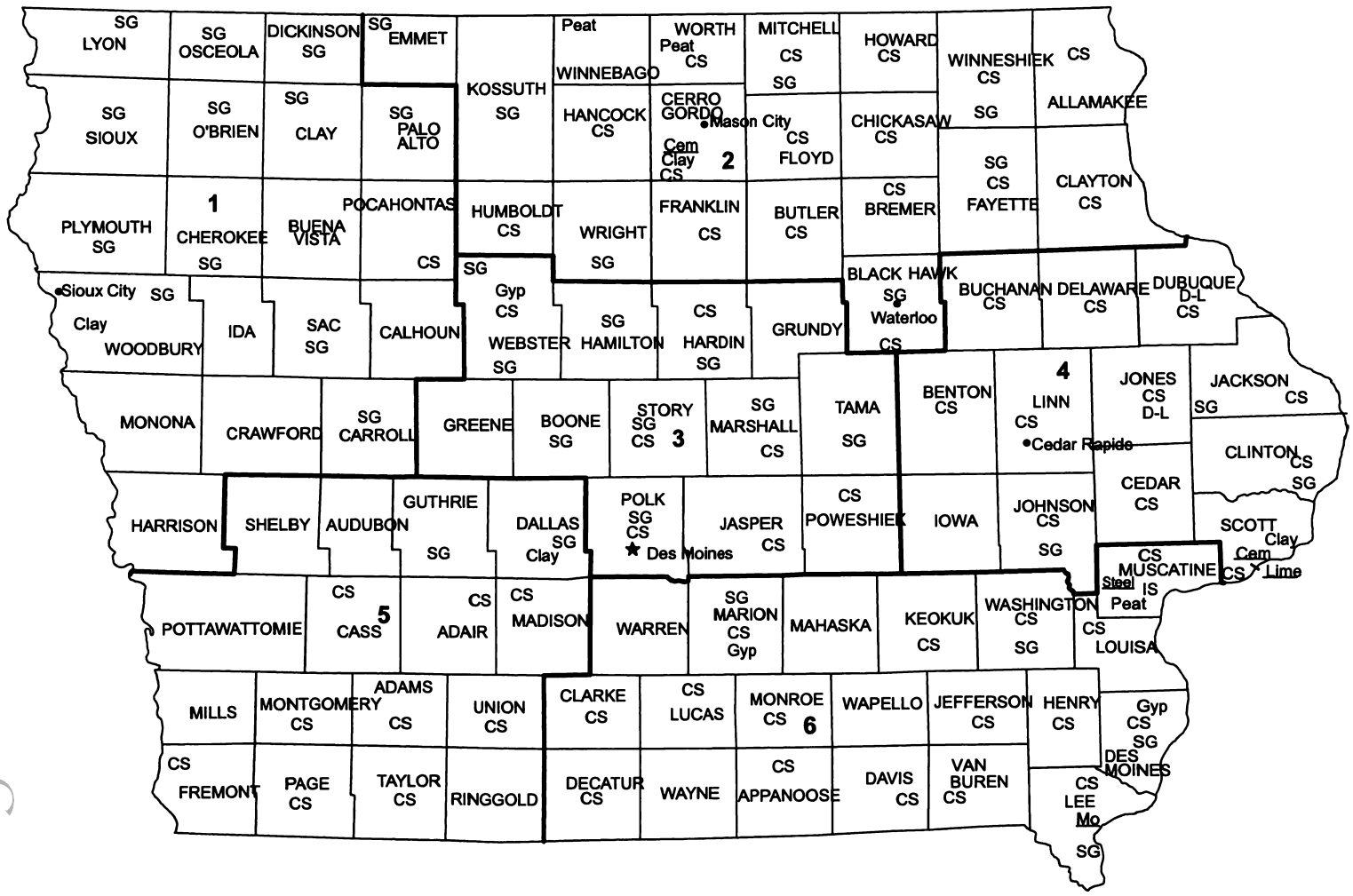
IOWA



LEGEND

- County boundary
- ★ Capital
- • City
- 1 Crushed stone/sand and gravel districts

MINERAL SYMBOLS (Major producing areas)

Cem	Cement plant
Clay	Common clay
CS	Crushed stone
D-L	Dimension limestone
Gyp	Gypsum
IS	Industrial sand
Lime	Lime plant
Mo	Molybdenum plant
Peat	Peat
SG	Construction sand and gravel
Steel	Steel plant

Source: Iowa Geological Survey and Land Quality Bureau/U.S. Geological Survey (2005)

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THE MINERAL INDUSTRY OF IOWA

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Iowa Geological Survey and Land Quality Bureau for collecting information on all nonfuel minerals.

In 2005, Iowa's nonfuel raw mineral production was valued[1] at $641 million, a 20%, or a $107 million, increase from that of 2004, based upon annual U.S. Geological Survey data. This followed a 6% increase in the State's total nonfuel mineral production value for 2004 from that of 2003, which was up more than 3% from that of 2002. The State was 29th in rank (28th in 2004) among the 50 States in total nonfuel mineral production value and accounted for more than 1% of the U.S. total. Yet, per capita, the State ranked 15th in the Nation in its minerals industry's value of nonfuel mineral production; with a population of close to 3 million, the value of production was nearly $220 per capita.

[1]The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2005 USGS mineral production data published in this chapter are those available as of December 2006. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—can be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

Cement (portland and masonry), crushed stone, construction sand and gravel, and gypsum (in descending order of value) were Iowa's leading nonfuel mineral commodities in 2005, accounting for nearly 97% of the State's total nonfuel mineral value. In 2005, most of the State's mineral commodities showed increases in production with the related increased values of cement, crushed stone (up $32 million), construction sand and gravel (up about $19 million), and gypsum, in descending order of change, leading the way. With a near doubling of production, the value of common clays more than quadrupled that of 2004 (table 1). Lime production and value also increased. Peat and industrial sand and gravel values decreased slightly and gemstones remained the same.

In 2005, Iowa rose to 2d from 4th in the quantities of gypsum produced and was 12th in portland cement production. Additionally, the State continued to be a significant producer of crushed stone, construction sand and gravel, and common clays (descending order of value). No metals were mined in Iowa; the State's metal production, including molybdenum and raw steel, resulted from the processing of materials acquired from other domestic and foreign sources.

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN IOWA[1,2]

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral	2003		2004		2005	
	Quantity	Value	Quantity	Value	Quantity	Value
Clays, common	256	763	325	1,150	630	4,740
Gemstones	NA	2	NA	2	NA	2
Sand and gravel, construction	13,400	61,000	17,100	74,300	19,900	93,100
Stone, crushed	35,600	207,000	35,800 r	219,000 r	34,500	251,000
Combined values of cement, gypsum (crude), lime, peat, sand and gravel (industrial)	XX	235,000	XX	239,000	XX	292,000
Total	XX	504,000	XX	534,000 r	XX	641,000

rRevised. NA Not available. XX Not applicable.
[1]Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2]Data are rounded to no more than three significant digits; may not add to totals shown.

TABLE 2
IOWA: CRUSHED STONE SOLD OR USED, BY KIND[1]

Kind	2004			2005		
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Number of quarries	Quantity (thousand metric tons)	Value (thousands)
Limestone[2]	159	33,800	$206,000	164	32,600	$237,000
Dolomite	37	1,990	13,000	34	1,940	14,200
Total	XX	35,800 r	219,000 r	XX	34,500	251,000

rRevised. XX Not applicable.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes limestone-dolomite reported with no distinction between the two.

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TABLE 3

IOWA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2005, BY USE[1]

(Thousand metric tons and thousand dollars)

Use	Quantity	Value
Construction:		
Coarse aggregate (+1½ inch):		
Macadam	146	927
Riprap and jetty stone	91	1,070
Filter stone	245	2,290
Other coarse aggregates	197	953
Total	679	5,240
Coarse aggregate, graded:		
Concrete aggregate, coarse	1,040	9,910
Bituminous aggregate, coarse	390	3,050
Bituminous surface-treatment aggregate	164	1,250
Railroad ballast	W	W
Other graded coarse aggregates	126	818
Total	1,720	15,000
Fine aggregate (-⅜ inch):		
Stone sand, concrete	(2)	(2)
Stone sand, bituminous mix or seal	172	1,220
Screening, undesignated	182	734
Other fine aggregates	71	581
Total	425	2,540
Coarse and fine aggregates:		
Graded road base or subbase	1,440	10,700
Unpaved road surfacing	2,950	19,300
Terrazzo and exposed aggregate	(3)	(3)
Crusher run or fill or waste	174	628
Roofing granules	(3)	(3)
Other coarse and fine aggregates	746	5,450
Total	5,420	37,400
Other construction materials	144	1,180
Agricultural:		
Limestone	500	2,450
Poultry grit and mineral food	(3)	(3)
Other agricultural uses	(3)	(3)
Total	931	8,270
Chemical and metallurgical:		
Lime manufacture	(3)	(3)
Flux stone	(3)	(3)
Glass manufacture	(3)	(3)
Total	1,140	6,980
Special, asphalt fillers or extenders	(4)	(4)
Other miscellaneous uses and specified uses not listed	67	216
Unspecified:[5]		
Reported	15,300	111,000
Estimated	8,600	63,000
Total	24,000	174,000
Grand total	34,500	251,000

W Withheld to avoid disclosing company proprietary data; included with "Other graded coarse aggregate."

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Withheld to avoid disclosing company proprietary data; included with "Other fine aggregate."

[3]Withheld to avoid disclosing company proprietary data; included in "Total."

[4]Withheld to avoid disclosing company proprietary data; included in "Unspecified: Reported."

[5]Reported and estimated production without a breakdown by end use.

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TABLE 4

IOWA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2005, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3		District 4	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Construction:								
Coarse aggregate (+1½ inch)[2]	--	--	157	1,010	W	W	W	W
Coarse aggregate, graded[3]	--	--	W	W	W	W	943	9,050
Fine aggregate (-⅜ inch)[4]	--	--	W	W	--	--	W	W
Coarse and fine aggregate[5]	--	--	W	W	W	W	W	W
Other construction materials	--	--	144	1,180	--	--	--	--
Agricultural[6]	--	--	W	W	W	W	W	W
Chemical and metallurgical[7]	--	--	--	--	--	--	W	W
Special[8]	--	--	--	--	--	--	W	W
Other miscellaneous uses	--	--	--	--	--	--	67	216
Unspecified:[9]								
Reported	1,440	10,300	3,240	23,200	2,690	19,300	4,570	33,300
Estimated	--	--	4,000	30,000	--	--	1,400	10,000
Total	1,440	10,300	9,910	69,200	3,370	26,300	10,600	78,200

	District 5		District 6		Unspecified districts	
	Quantity	Value	Quantity	Value	Quantity	Value
Construction:						
Coarse aggregate (+1½ inch)[2]	--	--	W	W	41	215
Coarse aggregate, graded[3]	--	--	W	W	24	191
Fine aggregate (-⅜ inch)[4]	--	--	W	W	84	584
Coarse and fine aggregates[5]	--	--	1,490	10,900	499	3,650
Other construction materials	--	--	--	--	--	--
Agricultural[6]	--	--	W	W	28	137
Chemical and metallurgical[7]	--	--	--	--	--	--
Special[8]	--	--	--	--	--	--
Other miscellaneous uses	--	--	--	--	--	--
Unspecified:[9]						
Reported	1,080	7,740	2,310	16,700	--	--
Estimated	2,500	18,000	712	5,200	--	--
Total	3,580	26,000	4,950	36,000	677	4,780

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes filter stone, macadam, riprap and jetty stone, and other coarse aggregate.

[3] Includes concrete aggregate (coarse), bituminous aggregate (coarse), bituminous surface-treatment aggregate, railroad ballast, and other graded coarse aggregate.

[4]Includes screening (undesignated), stone sand (bituminous mix or seal), stone sand (concrete), and other fine aggregate.

[5]Includes crusher run or fill or waste, graded road base or subbase, roofing granules, terrazzo exposed aggregate, unpaved road surfacing, and other coarse and fine aggregates.

[6]Includes agricultural limestone, poultry grit and mineral food, and other agricultural uses.

[7]Includes lime and glass manufacture and flux stone.

[8]Includes asphalt fillers or extenders.

[9]Reported and estimated production without a breakdown by end use.

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TABLE 5
IOWA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2005,
BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	2,090	$11,500	$5.51
Plaster and gunite sands	84	575	6.84
Concrete products (blocks, bricks, pipe, decorative, etc.)	25	166	6.73
Asphaltic concrete aggregates and other bituminous mixtures	170	659	3.88
Road base and coverings[2]	1,770	4,920	2.78
Fill	613	2,150	3.50
Snow and ice control	39	141	3.57
Other miscellaneous uses[3]	40	473	11.71
Unspecified:[4]			
Reported	9,720	47,900	4.93
Estimated	5,310	24,600	4.63
Total or average	19,900	93,100	4.69

[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.
[2]Includes road and other stabilization (lime).
[3]Includes roofing granules.
[4]Reported and estimated production without a breakdown by end use.

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TABLE 6

IOWA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2005, BY USE AND DISTRICT[1, 2]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		Districts 3 and 5	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate (including concrete sand)	466	2,560	537	2,460	165	1,060
Concrete products (blocks, bricks, pipe, decorative, etc.)[3]	W	W	W	W	11	38
Asphaltic concrete aggregates and other bituminous mixtures	--	--	126	556	44	102
Road base and coverings[4]	839	2,410	766	1,850	100	381
Fill	62	198	96	432	183	718
Snow and ice control	19	60	13	52	W	W
Other miscellaneous uses[5]	17	145	76	590	10	96
Unspecified:[6]						
Reported	2,190	11,000	7	58	6,740	33,300
Estimated	3,280	15,200	522	2,420	753	3,480
Total	6,870	31,500	2,140	8,410	8,000	39,100

Use	District 4		District 6		Unspecified districts	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate (including concrete sand)	560	3,730	366	1,730	--	--
Concrete products (blocks, bricks, pipe, decorative, etc.)[3]	39	354	--	--	--	--
Asphaltic concrete aggregates and other bituminous mixtures	--	--	--	--	--	--
Road base and coverings[4]	W	W	W	W	59	243
Fill	184	562	88	237	--	--
Snow and ice control	W	W	--	--	--	--
Other miscellaneous uses[5]	6	37	1	15	--	--
Unspecified:[6]						
Reported	456	1,960	326	1,620	--	--
Estimated	161	746	596	2,760	--	--
Total	1,410	7,390	1,380	6,360	59	243

W Withheld to avoid disclosing company proprietary data; included in "Other miscellaneous uses." -- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Districts 3 and 5 are combined to avoid disclosing company proprietary data.

[3]Includes plaster and gunite sands.

[4]Includes road and other stabilization (lime).

[5]Includes roofing granules.

[6]Reported and estimated production without a breakdown by end use.

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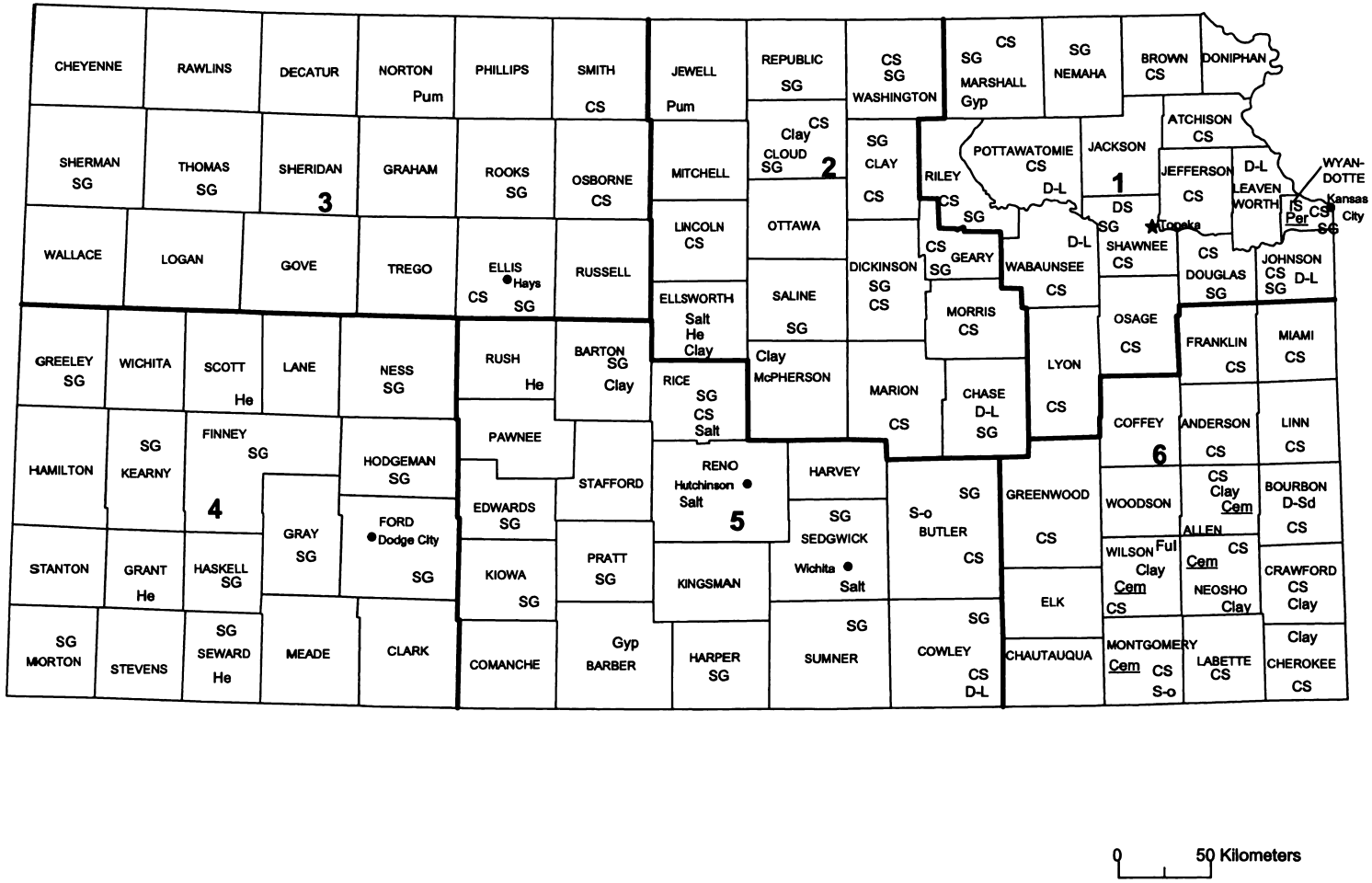
KANSAS



LEGEND

- County boundary
- ★ Capital
- ● City
- 1 Crushed stone/sand and gravel districts

MINERAL SYMBOLS (Major producing areas)

Cem	Cement plant
Clay	Common clay
CS	Crushed stone
D-L	Dimension limestone
D-Sd	Dimension sandstone
Ful	Fuller's earth
Gyp	Gypsum
He	Helium
IS	Industrial sand
Per	Perlite plant
Pum	Pumice and pumicite
S-o	Sulfur (oil)
Salt	Salt
SG	Construction sand and gravel

Source: Kansas geological Survey/U.S. Geological Survey (2005)

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THE MINERAL INDUSTRY OF KANSAS

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Kansas Geological Survey for collecting information on all nonfuel minerals.

In 2005, Kansas' nonfuel raw mineral production[1] was valued at $870 million, based upon annual U.S. Geological Survey (USGS) data. This represents an increase of $102 million, or 13.3%, from the State's total nonfuel mineral production value of 2004, following a 10.3% increase from that of 2003 to 2004. The State remained 23d in rank among the 50 States in total nonfuel mineral production value, of which Kansas accounted for nearly 1.6% of the U.S. total. Yet, per capita, the State ranked 12th in the Nation in its minerals industry's value of nonfuel mineral production; with a population of about 2.75 million, the value of production was about $317 per capita.

Portland cement, Grade-A helium, crushed stone, and salt were Kansas' leading nonfuel mineral commodities in 2005, accounting for about 28%, 26%, 18%, and 16%, respectively, of the State's total nonfuel mineral production value, and collectively about 88%. In 2005, increases in the production and values of crushed stone, Grade-A helium, and portland cement led the State's increase in nonfuel mineral value. The quantity of crushed stone produced increased by 7% resulting in a $37 million increase in value, a more than 30% increase from that of 2004. The value of Grade-A helium also rose by $37 million, up by nearly 20% from 2004; production was up by nearly 10%. The value of portland cement increased by $32 million, up by 15% from that of 2004, resulting in a more than 7% increase in its production. Also showing significant increases were salt and construction sand and gravel. Although the production of salt did not increase and that of construction sand and gravel increased only slightly, their values rose by $8 million and more than $4 million, respectively. The largest decreases in value took place for crude helium, down by about $12 million, and in common clays. Although common clay production showed a 5% increase, its value dropped by about $3 million, down by nearly 39% (table 1).

In 2005, Kansas continued to be the Nation's leading producer of Grade-A helium and crude helium (first of 2 producing States); it also remained 5th in the production of salt. Additionally, significant quantities of portland cement, crushed stone, construction sand and gravel, crude gypsum, and common clays (in descending order of value) were produced in the State. Production of nonfuel minerals in Kansas has consisted entirely of industrial minerals since 1970, following nearly a century (since 1877) of metallic mineral mining in the State. The last zinc and lead mining operation closed in 1970 owing in part to low zinc prices, low-grade ore, and the high operating costs of required pollution control systems.

The following narrative information was provided by the Kansas Geological Survey (KGS). The Kansas State Conservation Commission reported that 31 new surface mines opened in 2005 (Dr. Dennis Baker, written commun., January 8, 2007). Of these mines, 16 were private producers and 15 were county operations. Also during 2005, 21 surface mines and 2 underground mines closed. The number of private producers was 143, and they operated 506 sites. Additionally, 59 counties and government agencies operated 589 sites. Just about 810 hectares (ha) (2,000 acres) was affected by surface mining in the State and 67 ha (165 acres) was reclaimed.

Employment

Data from the Labor Management Information Services of the Kansas Department of Labor indicated that the annual average employment in all aspects of the mining and the oil and gas industry during 2005 was 7,569 people. This represents an 8% increase from the average employment of the entire mining industry, as was reported in 2004. The majority of these people (84%) were employed in the oil and gas industry, with the remainder employed in industrial mineral and coal operations. The industrial mineral and coal mining operations averaged 1.2 persons in the extraction and support sector (consulting and permitting) of the industry. Mining, excluding oil and gas, employed approximately 1,164 people, with an annual average salary of $40,162. This represents a 6.5% increase in the number of employees and a 0.2% increase in average salary reported, compared with respective values in 2004. All other mining support activities employed 4,346 employees at an annual average salary of $42,045 per year in 2005.

Commodity Review

Industrial Minerals

Crushed Stone.—The Inland Quarry in Wyandotte County announced that it will be closing. The mine is primarily an underground operation mining limestone. A portion of the mine was operated as an underground storage facility for several years. Hunt Midwest Mining, Inc. closed 15 quarries in Kansas. Hunt Midwest Mining, Inc. and Martin Marietta Materials, Inc. merged their Kansas City operations. The new company, Hunt Martin Materials, LLC, will produce and market crushed limestone. Lafarge North America Inc. acquired the Ritchie Companies of Wichita. The Ritchie Companies were suppliers of construction materials, operated sand and gravel mines, and did paving contracting.

[1]The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2005 USGS mineral production data published in this chapter are those available as of December 2006. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—can be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

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Mine Reclamation Awards

The Kansas Governor's Mined Land Reclamation Award for 2005 went to Bayer Stone Inc. in St. Marys, a city in Pottawatomie County, KS.

Legislation and Government Programs

The Kansas Legislature in 2005 passed and the Governor signed House Bill 2103 that extends the exception from scale tolerances for weighing vehicles transporting aggregates and extends the current scale tolerance of ±100 pounds until 2011.

The 2005 Kansas Field Conference led by the Kansas Geological Survey took State legislators to the Vonada Stone Company quarry in Lincoln County. The Vonada Stone Company quarries the Fencepost limestone bed of the Cretaceous-age Greenhorn Formation and produces the finished stone product for decorative signs, mailbox posts, and outdoor furniture. The field conference guidebook is available from the Kansas Geological Survey (Sawin and others, 2005).

Geologic mapping continued with Federal matching funding from the STATEMAP program, a component of the USGS National Cooperative Mapping Program, which is congressionally mandated by the National Cooperative Geologic Mapping Program (NCGMP). The USGS distributes Federal funds through NCGMP to support geologic mapping efforts utilizing a competitive funding process. The NCGMP has three primary components: (1) FEDMAP, which funds Federal geologic mapping projects, (2) STATEMAP, which is a matching-funds grant program with State geological surveys, and (3) EDMAP, a matching-funds grant program with universities that has a goal to train the next generation of geologic mappers. One county geologic map was completed during 2005: a digital upgrade map of Wabaunsee County (KGS M-111). Geologic field mapping continued during the year in Geary, Pawnee, Saline, and Washington Counties. Preliminary geologic maps of Geary County were released along with reports on coalbed methane, ground water, energy resources, geophysics, and other geology-related studies. A total of 55 open-file reports were filed with the library at the Kansas Geological Survey.

Reference Cited

Sawin, R.S., Buchanan, R.C., Evans, C.S., and McCauley, J.R., 2005, Kansas Field Conference, field guide, 2005 field conference, central Great Plains, water, recreation, and economic development: Kansas Geological Survey Open-File Report 2005-17, variously paginated.

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN KANSAS[1, 2]

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral		2003 Quantity	2003 Value	2004 Quantity	2004 Value	2005 Quantity	2005 Value
Cement, portland		2,270	173,000 e	2,690	212,000 e	2,890	244,000 e
Clays, common		632	10,000	621	7,460	654	4,590
Gemstones		NA	1	NA	1	NA	1
Helium, Grade-A	million cubic meters	77	179,000	82	189,000	90	226,000
Salt		2,770	123,000	2,890	127,000	2,890	135,000
Sand and gravel, construction		10,700	34,900	9,930	32,800	10,100	36,900
Stone:							
Crushed		20,700	111,000	20,600 r	122,000 r	22,100	159,000
Dimension		15	1,640	14	1,730	13	1,590
Combined values of cement (masonry), clays (fuller's earth), gypsum (crude), helium (crude), pumice and pumicite, sand and gravel (industrial)		XX	65,100	XX	75,300	XX	63,100
Total		XX	696,000	XX	768,000 r	XX	870,000

eEstimated. rRevised. NA Not available. XX Not applicable.
[1]Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2]Data are rounded to three significant digits; may not add to totals shown.

TABLE 2
KANSAS: CRUSHED STONE SOLD OR USED, BY KIND[1]

Kind	2004 Number of quarries	2004 Quantity (thousand metric tons)	2004 Value (thousands)	2005 Number of quarries	2005 Quantity (thousand metric tons)	2005 Value (thousands)
Limestone	107 r	20,100	$120,000	114	21,500	$155,000
Quartzite	2	521	2,130	2	599	4,310
Total	XX	20,600 r	122,000 r	XX	22,100	159,000

rRevised. XX Not applicable.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.

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TABLE 3

KANSAS: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2005, BY USE[1]

(Thousand metric tons and thousand dollars)

Use	Quantity	Value
Construction:		
Coarse aggregate (+1½ inch):		
Macadam	W	W
Riprap and jetty stone	193	1,420
Filter stone	180	1,830
Other coarse aggregate	127	1,080
Total	500	4,320
Coarse aggregate, graded:		
Concrete aggregate, coarse	(2)	(2)
Bituminous aggregate, coarse	(2)	(2)
Bituminous surface-treatment aggregate	(2)	(2)
Railroad ballast	(2)	(2)
Other graded coarse aggregate	181	1,200
Total	855	6,080
Fine aggregate (-⅜ inch):		
Stone sand, concrete	(2)	(2)
Stone sand, bituminous mix or seal	(2)	(2)
Screening, undesignated	225	1,190
Total	284	1,610
Coarse and fine aggregates:		
Graded road base or subbase	1,100	6,110
Unpaved road surfacing	439	1,240
Crusher run or fill or waste	176	981
Other coarse and fine aggregates	768	5,080
Total	2,480	13,400
Other construction materials	2	6
Agricultural limestone	(3)	(3)
Chemical and metallurgical, cement manufacture	3,260	28,600
Unspecified:[4]		
Reported	10,400	74,300
Estimated	4,300	31,000
Total	14,700	105,000
Grand total	22,100	159,000

W Withheld to avoid disclosing company proprietary data; included with "Other coarse aggregate."

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Withheld to avoid disclosing company proprietary data; included in "Total."

[3]Withheld to avoid disclosing company proprietary data; included in "Unspecified: Reported."

[4]Reported and estimated production without a breakdown by end use.

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TABLE 4

KANSAS: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2005, BY USE AND DISTRICT[1, 2]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Construction:						
Coarse aggregate (+1½ inch)[3]	W	W	W	W	--	--
Coarse aggregate, graded[4]	W	W	W	W	--	--
Fine aggregate (-⅜ inch)[5]	W	W	W	W	--	--
Coarse and fine aggregate[6]	761	4,980	W	W	128	394
Other construction materials	--	--	--	--	--	--
Agricultural[7]	W	W	W	W	--	--
Chemical and metallurgical[8]	--	--	--	--	--	--
Unspecified:[9]						
Reported	3,510	25,200	1,680	12,100	--	--
Estimated	2,200	16,000	--	--	23	167
Total	7,200	51,100	3,380	22,700	151	561

Use	District 5		District 6	
	Quantity	Value	Quantity	Value
Construction:				
Coarse aggregate (+1½ inch)[3]	W	W	W	W
Coarse aggregate, graded[4]	--	--	W	W
Fine aggregate (-⅜ inch)[5]	W	W	W	W
Coarse and fine aggregate[6]	W	W	W	W
Other construction materials	--	--	2	6
Agricultural[7]	W	W	W	W
Chemical and metallurgical[8]	--	--	3,260	28,600
Unspecified:[9]				
Reported	222	1,590	4,840	34,800
Estimated	906	6,500	1,100	8,200
Total	1,290	9,150	10,100	75,300

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]No crushed stone was produced in District 4.

[3]Includes filter stone, macadam, riprap and jetty stone, and other coarse aggregate.

[4]Includes concrete aggregate (coarse), bituminous aggregate (coarse), bituminous surface-treatment aggregate, railroad ballast, and other graded coarse aggregate.

[5]Includes screening (undesignated), stone sand (bituminous mix or seal), and stone sand (coarse).

[6]Includes crusher run or fill or waste, graded road base or subbase, unpaved road surfacing, and other coarse and fine aggregates.

[7]Includes agricultural limestone.

[8]Includes cement manufacture.

[9]Reported and estimated production without a breakdown by end use.

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TABLE 5
KANSAS: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2005,
BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	2,310	$9,690	$4.20
Concrete products (blocks, bricks, pipe, decorative, etc.)[2]	39	147	3.77
Asphaltic concrete aggregates and other bituminous mixtures	545	3,080	5.65
Road base and coverings[3]	1,820	5,530	3.04
Fill	1,180	2,610	2.21
Snow and ice control	87	364	4.17
Other miscellaneous uses	3	58	20.72
Unspecified:[4]			
Reported	1,350	5,630	4.16
Estimated	2,720	9,750	3.58
Total or average	10,100	36,900	3.66

[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.
[2]Includes plaster and gunite sands.
[3]Includes road and other stabilization (lime).
[4]Reported and estimated production without a breakdown by end use.

TABLE 6
KANSAS: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2005, BY USE AND DISTRICT[1, 2]

(Thousand metric tons and thousand dollars)

Use	District 1		Districts 2 and 3		District 4	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate (including concrete sand)	1,040	4,610	225	998	226	1,530
Concrete products (blocks, bricks, pipe, decorative, etc.)[3]	W	W	6	25	W	W
Asphaltic concrete aggregates and other bituminous mixtures	165	781	157	731	101	774
Road base and coverings[4]	W	W	562	1,560	568	1,580
Fill	156	531	127	451	54	124
Snow and ice control	W	W	40	180	11	30
Other miscellaneous uses	64	349	3	57	6	17
Unspecified:[5]						
Reported	3	16	30	111	134	1,280
Estimated	938	3,360	491	1,760	512	1,830
Total	2,360	9,650	1,640	5,870	1,610	7,160

Use	Districts 5 and 6		Unspecified districts	
	Quantity	Value	Quantity	Value
Concrete aggregate (including concrete sand)	815	2,540	5	20
Concrete products (blocks, bricks, pipe, decorative, etc.)[3]	23	90	--	--
Asphaltic concrete aggregates and other bituminous mixtures	89	601	33	194
Road base and coverings[4]	643	2,140	W	W
Fill	834	1,480	8	17
Snow and ice control	17	52	W	W
Other miscellaneous uses	(6)	1	7	24
Unspecified:[5]				
Reported	1,190	4,220	--	--
Estimated	781	2,800	--	--
Total	4,390	13,900	52	256

W Withheld to avoid disclosing company proprietary data; included in "Other miscellaneous uses." -- Zero.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Districts 2 and 3 and 5 and 6 are combined to avoid disclosing company proprietary data.
[3]Includes plaster and gunite sands.
[4]Includes road and other stabilization (lime).
[5]Reported and estimated production without a breakdown by end use.
[6]Less than ½ unit.

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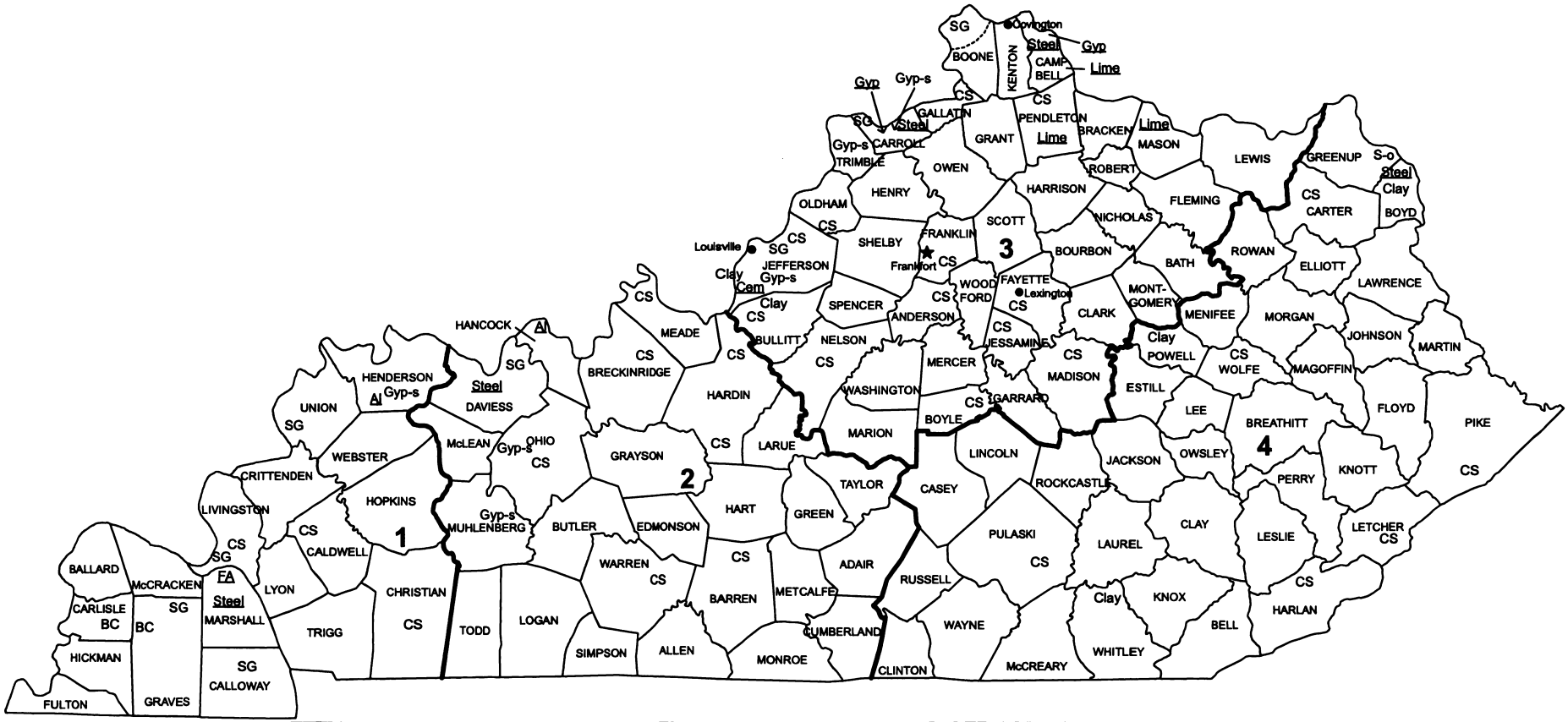
KENTUCKY



LEGEND

- County boundary
- Capital
- City
- 1 Crushed stone/sand and gravel districts

MINERAL SYMBOL (Major producing areas)

- Al Aluminum plant
- BC Ball clay
- Cem Cement plant
- Clay Common clay
- CS Crushed stone
- FA Ferroalloys plant
- Gyp Gypsum plant
- Gyp-s Synthetic gypsum
- Lime Lime plant
- S-o Sulfur (oil)
- SG Construction sand and gravel
- Steel Steel plant
- Concentration of mineral operations

Source: Kentucky Geological Survey/U.S. Geological Survey (2005)

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THE MINERAL INDUSTRY OF KENTUCKY

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Kentucky Geological Survey for collecting information on all nonfuel minerals.

In 2005, Kentucky's nonfuel raw mineral production was valued[1] at $765 million, a 10.7% increase from that of 2004, based upon annual U.S. Geological Survey (USGS) data. This followed a 15.8% increase in the State's total nonfuel mineral production value for 2004 from 2003, which was up more than10% from 2002. Kentucky was 27th in rank (25th in 2004) among the 50 States in total nonfuel mineral production value, accounting for nearly 1½% of the U.S. total. Yet, per capita, the State ranked 18th in the Nation in its minerals industry's value of nonfuel mineral production; with a population of about 4.2 million, the value of production was about $180 per capita.

Crushed stone continued to be Kentucky's leading nonfuel mineral commodity in 2005 and accounted for 55% of the State's raw nonfuel mineral value. Lime was second, followed by cement (portland and masonry) and construction sand and gravel. These four mineral commodities accounted for nearly 98% of the State's total nonfuel mineral production value. In 2005, each of the four leading nonfuel mineral commodities rose in value. The value of crushed stone rose by $37 million, up about 9.5% from that of 2004, although production decreased by more than 6%. With a relatively small increase in cement production, the commodity's value rose by about $25 million. These increases were followed by progressively smaller yet significant increases in the values of lime and construction sand and gravel. Although having minimal effect on the State's total nonfuel mineral value, the value of gemstones was up 250% in 2005 from that of 2004 (table 1).

In 2005, Kentucky continued to rank 2d in the quantity of lime that was produced and 4th in ball clay among the other producing States, and it rose to 7th from 11th in the production of common clays. Additionally, the State produced significant quantities of crushed stone (11th), portland cement, and construction sand and gravel (descending order of value). Primary aluminum and raw steel were produced from materials obtained from other domestic and foreign sources. Kentucky remained the Nation's leading producer of primary aluminum.

The following narrative information was provided by the Kentucky Geological Survey[2] (KGS).

[1]The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2005 USGS mineral production data published in this chapter are those available as of December 2006. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—can be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

[2]Warren H. Anderson, Geologist and Principal Investigator with the Kentucky Geological Survey, submitted the text of the State mineral industry information provided by that State agency.

Exploration Activities

In 2005 in a joint project, new fluorite exploration took place in the Western Kentucky Fluorspar District; Hastie Mining and Trucking Co. and Moodie Minerals Inc. conducted core drilling along the Klondike Mine area in Livingston County and reported significant shows of fluorspar along the fault systems. The two companies planned to continue core drilling to identify reserves necessary to justify the development and opening of a fluorspar mine. Since 1978 when Frontier Spar Corp. closed its Babb-Barnes underground mine and mill near Salem, Livingston County, no significant production of fluorspar has been reported in the State (Harrison and McGrain, 1981, p. 229). Intermittently, relatively small quantities have been processed from previously mined material and some exploration activities have took place during the intervening years.

The KGS and the Department of Earth and Environmental Sciences (both of the University of Kentucky) continued to examine three dikes in the Coefield Creek ultramafic intrusive complex in Crittenden County. Alkalic lamprophyre dikes had tentatively been identified as Alnoite and research efforts focused on investigating the possibility of the dikes similarity to diamond-bearing lamprophyres of western Australia (Heck and others, 2006). Included in the study were samples from approximately 20 dikes in the region; further studies were aimed at identifying additional lamprophyre dikes.

Commodity Review

Industrial Minerals

Crushed Stone.— The Vulcan Materials Co. Grand Rivers Quarry (formerly Reed Quarry) in far western Kentucky (Paducah) continued to be the State's leading producing quarry, based upon total output of crushed stone and, based upon 2005 USGS data, was the seventh leading quarry in the United States.

Acquisition activity continued to be slow; instead many companies appeared to be upgrading existing plants and operations. The Rodgers Group Inc. invested $8 million in a new system to process limestone at its Jefferson County Stone Quarry in Jefferson County (Markley, 2006). Vulcan Materials upgraded its Grand Rivers Quarry by installing $20 million worth of new crushers and conveyors (Drake, 2005§[3]). Hanson Aggregates Midwest, Inc. installed an air separator to handle fines in its Tyrone Quarry operations in Lawrenceburg, in east central Kentucky (Constantino, 2004§).

[3]References that include a section mark (§) are found in the Internet References Cited section.

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Environmental Issues—Recycling and Mine Reuse

Recycling

Gypsum and Aggregate.—Recycled waste products from industrial plants continued to find new markets in Kentucky operations. LaFarge Gypsum Co. in Campbell County and BPB Celotex in Carroll County continued to use synthetic scrubber gypsum from coal-fired powerplant byproducts to make gypsum wallboard (Greb and Anderson, 2006). Fly ash and bottom ash from the same coal-fired plants continued to be used as road aggregate and fill, yet the volume of the materials remained so great that most ash still was placed in landfills. Other construction and aggregate uses of these powerplant byproducts, such as uses in synthetic aggregates for concrete and asphalt, were considered to be a potentially useful future means for the disposing of the plants' additional byproducts.

Steel.—In October, AK Steel Corp. constructed a new recycling facility to process the plant's waste materials from the blast furnace, coke making, and continuous caster operations. The unit recovered carbon and iron in the form of briquettes, where they were used as feedstock for the first step in the steelmaking process (Greb and Anderson, 2006).

Mine Reuse, Partnering, and Technology

An abandoned underground limestone mine found new life as an underground Critical Infrastructure Protection facility for the storage of electronic data in Louisville, KY. The "e-Cavern" site is approximately 30 meters beneath Louisville and an interstate highway, and the site provides nearly 280,000 square meters (3 million square feet), or nearly 28 hectares, of underground limestone cavern space, for critical data processing and storage and communications facilities (e-Cavern Corp., undated§). The facility contained a state-of-the-art conference center, office space with full internet capability, and an underground café. Partnering with the University of Kentucky, the University of Louisville, and several major companies, e-Cavern, LLC, was designing, building, and storing electronic data in a secure environment for the financial, governmental, business, and military industries (Lightfoot, 2006§).

Government Issues

Transportation and weight limits for natural resource haulers continued to be an important issue during 2005. A bill to increase weight limits for aggregate and sand trucks on State roads was submitted to the Kentucky legislature in the fall of 2004. The bill followed the outgrowth of a lawsuit in an eastern Kentucky court, which challenged the current weight limit imposed on natural resource haulers because it differed from the limit for coal haulers. The current weight limit for hauling sand, gravel, and aggregate is 36 metric tons (t). Some road builders and truckers have lobbied to allow minerals other than coal to be transported at the same weight limits as coal, or 54 t, with an extended weight permit. Many city and county leaders, environmentalists, and truckers opposed the bill. In March 2005, a modified version of the bill passed the State Senate, but failed in the House, owing to the concern that the legislation would allow more overweight trucks on the road (Greb and Anderson, 2006).

Issues related to the Clean Water Act and the U.S. Army Corps of Engineers use of Nationwide Permit (NP) 21 in the mine permitting process have typically focused on coal mining, but industrial minerals mining is also affected. In Kentucky, NP 21 and NP 26 are used by the nonfuel mining industry for permitting. If either of these would be withdrawn for industrial minerals, the nonfuel mining industry would have to use NP 44, considered a more burdensome and complex permitting process. A November 2005 ruling of the Fourth Circuit U.S. Court of Appeals allowed noncoal mining companies to operate under NP 21 and NP 26 (Greb and Anderson, 2006).

The University of Kentucky continued research efforts into carbon sequestration issues and the effects on nearby underground limestone mining operations. Carbon dioxide (CO_2) injected into the ground is generally injected into deep sites which sequester the CO_2. Generally, the depth of sequestering sites is far deeper than any mine depth and the limited local radius of influence from the injection would unlikely interfere with underground mines.

During 2005, the KGS continued to compile a set of digital 30 x 60 1:100,000-scale maps for public distribution. The KGS planned to continue to release these maps by means of the KGS GeoPortal, an Internet map server. This Web site allows a user to download various types of geologic maps and data to create custom maps (http://kgsmap.uky.edu/website/KGSGeoPortal/KGSGeoPortal.asp).

The KGS was in the initial stages of creating a minerals database that would be accessible by means of the Internet and be of value to the minerals industry. Currently, information on coal, oil, gas, and water resources in the State can be downloaded from the KGS Web site (http://www.uky.edu/KGS/home.htm) under "Internet Map Services." Once completed, the minerals database will have similar capabilities and make minerals information available for public distribution.

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TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN KENTUCKY[1, 2]

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral	2003		2004		2005	
	Quantity	Value	Quantity	Value	Quantity	Value
Clays, common	983	3,770	978	4,510	1,060	4,370
Gemstones	NA	22	NA	22	NA	78
Sand and gravel, construction	10,000	46,500	10,300	49,700	10,500	55,000
Stone, crushed	52,400	326,000	62,100 r, 3	384,000 r, 3	58,200 3	421,000 3
Combined values of cement, clays (ball), lime, stone (crushed dolomite [2004-05])	XX	220,000	XX	253,000 r	XX	285,000
Total	XX	597,000	XX	691,000 r	XX	765,000

rRevised. NA Not available. XX Not applicable.
[1]Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2]Data are rounded to three significant digits; may not add to totals shown.
[3]Excludes certain stones; kind and value included with "Combined values" data.

TABLE 2
KENTUCKY: CRUSHED STONE SOLD OR USED, BY KIND[1]

Kind	2004			2005		
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Number of quarries	Quantity (thousand metric tons)	Value (thousands)
Limestone[2]	88 r	62,100	$384,000	87	58,200	$421,000
Dolomite	1	W	W	1	W	W
Total	XX	62,100 r	384,000 r	XX	58,200	421,000

rRevised. W Withheld to avoid disclosing company proprietary data. XX Not applicable.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes limestone-dolomite reported with no distinction between the two.

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TABLE 3

KENTUCKY: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2005, BY USE[1]

(Thousand metric tons and thousand dollars)

Use	Quantity	Value
Construction:		
Coarse aggregate (+1½ inch):		
Macadam	W	W
Riprap and jetty stone	237	1,900
Filter stone	215	1,390
Other coarse aggregates	1,090	7,590
Total	1,540	10,900
Coarse aggregate, graded:		
Concrete aggregate, coarse	1,250	9,340
Bituminous aggregate, coarse	4,360	32,900
Bituminous surface-treatment aggregate	(2)	(2)
Railroad ballast	(2)	(2)
Other graded coarse aggregates	3,030	21,900
Total	9,020	66,700
Fine aggregate (-⅜ inch):		
Stone sand, concrete	(3)	(3)
Stone sand, bituminous mix or seal	405	3,140
Screening, undesignated	260	1,930
Other fine aggregates	3,240	18,100
Total	3,910	23,200
Coarse and fine aggregates:		
Graded road base or subbase	2,530	17,600
Unpaved road surfacing	1,800	16,000
Crusher run or fill or waste	(4)	(4)
Other coarse and fine aggregates	6,520	46,100
Total	10,900	79,700
Agricultural limestone	671	3,750
Chemical and metallurgical, lime manufacture	(5)	(5)
Other miscellaneous uses and specified uses not listed	32	220
Unspecified:[6]		
Reported	11,900	90,200
Estimated	20,000	150,000
Total	32,100	236,000
Grand total	58,200	421,000

W Withheld to avoid disclosing company proprietary data; included with "Other coarse aggregate."

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Withheld to avoid disclosing company proprietary data; included in "Total."

[3]Withheld to avoid disclosing company proprietary data; included with "Other fine aggregate."

[4]Withheld to avoid disclosing company proprietary data; included with "Other coarse and fine aggregates."

[5]Withheld to avoid disclosing company proprietary data; included in "Unspecified: Reported."

[6]Reported and estimated production without a breakdown by end use.

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TABLE 4
KENTUCKY: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2005, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3		District 4	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Construction:								
Coarse aggregate (+1½ inch)[2]	W	W	465	3,480	W	W	W	W
Coarse aggregate, graded[3]	W	W	3,290	24,600	W	W	W	W
Fine aggregate (-⅜ inch)[4]	W	W	W	W	1,720	7,870	W	W
Coarse and fine aggregate[5]	W	W	W	W	7,260	55,000	W	W
Agricultural[6]	W	W	W	W	W	W	W	W
Chemical and metallurgical[7]	--	--	--	--	W	W	--	--
Other miscellaneous use	--	--	31	213	--	--	1	7
Unspecified:[8]								
Reported	2,900	20,800	2,170	15,700	2,490	18,000	685	4,950
Estimated	99	719	4,100	30,000	8,500	62,000	7,500	54,000
Total	6,830	45,900	13,400	97,600	26,500	196,000	11,400	81,300

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes filter stone, macadam, riprap and jetty stone, and other coarse aggregate.

[3]Includes bituminous aggregate (coarse), bituminous surface-treatment aggregate, concrete aggregate (coarse), railroad ballast, and other graded coarse aggregate.

[4]Includes screening (undesignated), stone sand (bituminous mix or seal), stone sand (concrete), and other fine aggregate.

[5]Includes crusher run or fill or waste, graded road base or subbase, unpaved road surfacing, and other coarse and fine aggregates.

[6]Includes agricultural limestone.

[7]Includes lime manufacture.

[8]Reported and estimated production without a breakdown by end use.

TABLE 5
KENTUCKY: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2005, BY MAJOR USE CATEGORY[1, 2]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate and concrete products	4,940	$28,100	$5.70
Asphaltic concrete aggregates and road base materials	224	1,350	6.02
Fill	172	778	4.52
Unspecified:[3]			
Reported	2,450	12,100	4.95
Estimated	2,700	12,600	4.68
Total or average	10,500	55,000	5.25

[1]To avoid disclosing company proprietary data, no district tables were produced for 2005.

[2]Data are rounded to no more than three significant digits; may not add to totals shown.

[3]Reported and estimated production without a breakdown by end use.

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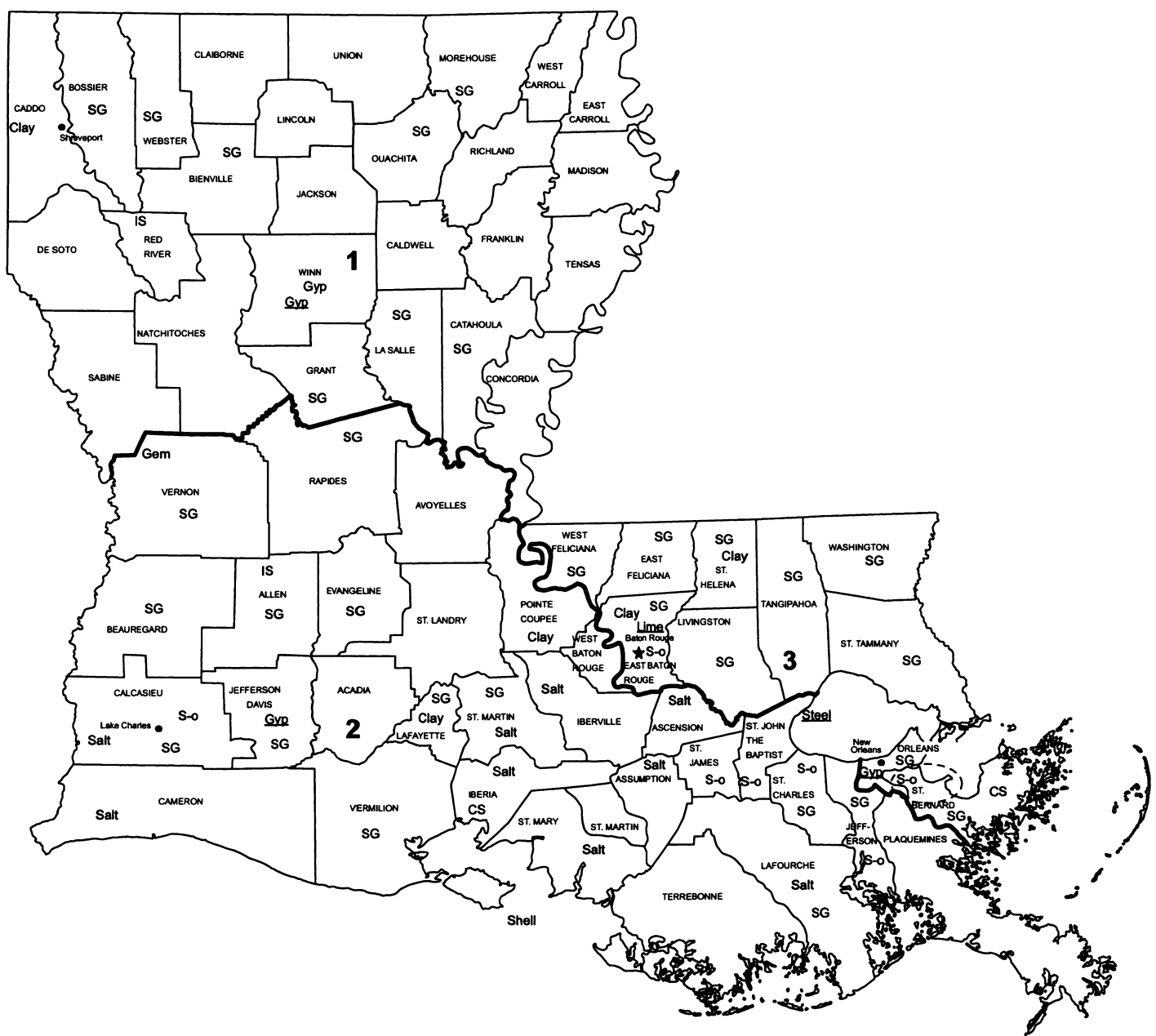
LOUISIANA



LEGEND

- Parish boundary
- Capital
- City
- 1 — Crushed stone/sand and gravel districts

MINERAL SYMBOLS (Major producing areas)

Clay	Common clay
CS	Crushed stone
Gem	Gemstones
Gyp	Gypsum
Gyp	Gypsum plant
IS	Industrial sand
Lime	Lime plant
S-o	Sulfur (oil)
Salt	Salt
SG	Construction sand and gravel
Shell	Shell
Steel	Steel plant
	Concentration of mineral operations

Source: Louisiana Geological Survey/U.S. Geological Survey (2005)

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The Mineral Industry of Louisiana

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Louisiana Geological Survey for collecting information on all nonfuel minerals.

In 2005, Louisiana's nonfuel raw mineral production[1] was valued at $393 million, based upon annual U.S. Geological Survey (USGS) data. This was a $27 million, or 7.4%, increase compared with production in 2004, which was down 4.7% from that of 2003. The State continued to be 36th in rank among the 50 States in total nonfuel mineral production value, and Louisiana accounted for slightly less than 1% of the U.S. total.

Louisiana's leading nonfuel raw mineral, based upon value, continued to be salt, accounting for about 46% of the State's nonfuel mineral value in 2005. This was followed (descending order of value) by construction sand and gravel, making up about 29% of the State's value, crushed stone including crushed shell [mostly imported materials sold through sales yards, not from materials mined within the State (except for instate-mined crushed shell); all company proprietary data], common clays, and industrial sand and gravel, accounting for about 3% of the same value, as gypsum, lime, and gemstones (table 1). Aluminum, raw steel, and vanadium were also produced, but these were produced from materials obtained from other domestic and foreign sources. Sulfur was produced as a byproduct of oil and gas production.

[1]The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2005 USGS mineral production data published in this chapter are those available as of December 2006. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—can be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

In 2005, increases mostly in the values of crushed stone, construction sand and gravel, and gypsum, in descending order of change, led the State's increase in value for the year. The substantial increases in the values of crushed stone and gypsum resulted from large increases in the quantities of each that were produced (both quantities and values withheld—company proprietary data), although a significant amount of the crushed stone sold or used in Louisiana was not mined in-State, but was shipped in from Mexico and from Kentucky and other States. Although construction sand and gravel production was down 4%, its value of production was up $10 million. The increase in gypsum value resulted from a significant increase in one company's reported value of production that was consumed at its wallboard plant near New Orleans; an undetermined portion of this crude material was imported from neighboring States. There was a smaller yet significant increase of $2 million in the production of common clays. These increases were offset somewhat by a decrease in the value of salt, down $4 million, and also that of industrial sand and gravel. The unit value of salt increased slightly, but although production (quantity) of industrial sand and gravel increased by about 7%, a drop in its average unit value of about 27% to about $23 per metric ton (from $31) accounted for its decrease in value of $3.2 million (table 1).

Louisiana continued to lead the Nation in the quantity of salt produced, first out of 15 producing States. Additionally, the State was a significant producer of construction sand and gravel, common clays, and industrial sand and gravel (descending order of value).

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TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN LOUISIANA[1, 2]

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral	2003		2004		2005	
	Quantity	Value	Quantity	Value	Quantity	Value
Clays, common	670	19,100 r	399	11,000 r	416	13,100
Gemstones	NA	6	NA	6	NA	6
Salt	12,600	152,000	14,300	186,000	13,800	182,000
Sand and gravel:						
Construction	21,200	105,000	19,400	103,000	18,600	113,000
Industrial	499	17,200	476	14,800	509	11,600
Combined values of gypsum (crude), lime, stone (crushed limestone and sandstone [2004-05], limestone, sandstone, miscellaneous [2003])	XX	91,000	XX	51,300 r	XX	73,800
Total	XX	384,000 r	XX	366,000 r	XX	393,000

rRevised. NA Not available. XX Not applicable.
[1]Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2]Data are rounded to three significant digits; may not add to totals shown.

TABLE 2
LOUISIANA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2005, BY USE[1, 2, 3]

(Thousand metric tons and thousand dollars)

Use	Quantity	Value
Construction:		
Coarse aggregate (+1½ inch), other coarse aggregate	W	W
Coarse aggregate, graded, other graded coarse aggregate	W	W
Fine aggregate (-⅜ inch), other fine aggregate	W	W
Coarse and fine aggregates, other coarse and fine aggregates	W	W
Unspecified:[4]		
Reported	2,000	14,300
Estimated	262	2,200
Total	W	W

W Withheld to avoid disclosing company proprietary data.
[1]Data are rounded to no more than three significant digits.
[2]Most of the production included in this table was shipped into Louisiana from other States.
[3]To avoid disclosing company proprietary data, no district tables were produced for 2005.
[4]Reported and estimated production without a breakdown by end use.

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TABLE 3
LOUISIANA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2005,
BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	7,250	$45,800	$6.32
Asphaltic concrete aggregates and other bituminous mixtures	211	1,660	7.85
Road base and coverings[2]	1,440	13,200	9.20
Fill	1,190	3,760	3.15
Other miscellaneous uses[3]	113	2,020	17.83
Unspecified:[4]			
Reported	3,510	20,900	5.95
Estimated	4,930	25,800	5.24
Total or average	18,600	113,000	6.07

[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.
[2]Includes road and other stabilization (cement).
[3]Includes railroad ballast.
[4]Reported and estimated production without a breakdown by end use.

TABLE 4
LOUISIANA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2005,
BY USE AND DISTRICT[1, 2]

(Thousand metric tons and thousand dollars)

Use	Districts 1 and 2		District 3		Unspecified districts	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate (including concrete sand)	1,730	14,400	5,520	31,500	--	--
Asphaltic concrete aggregates and road base materials[3]	1,040	10,000	611	4,850	--	--
Fill	700	2,240	492	1,520	--	--
Other miscellaneous uses[4]	64	1,050	49	967	--	--
Unspecified:[5]						
Reported	2,180	13,000	281	1,670	1,050	6,280
Estimated	3,170	16,600	1,760	9,230	--	--
Total	8,880	57,200	8,720	49,700	1,050	6,280

-- Zero.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Districts 1 and 2 are combined to avoid disclosing company proprietary data.
[3]Includes road and other stabilization (cement).
[4]Includes railroad ballast.
[5]Reported and estimated production without a breakdown by end use.

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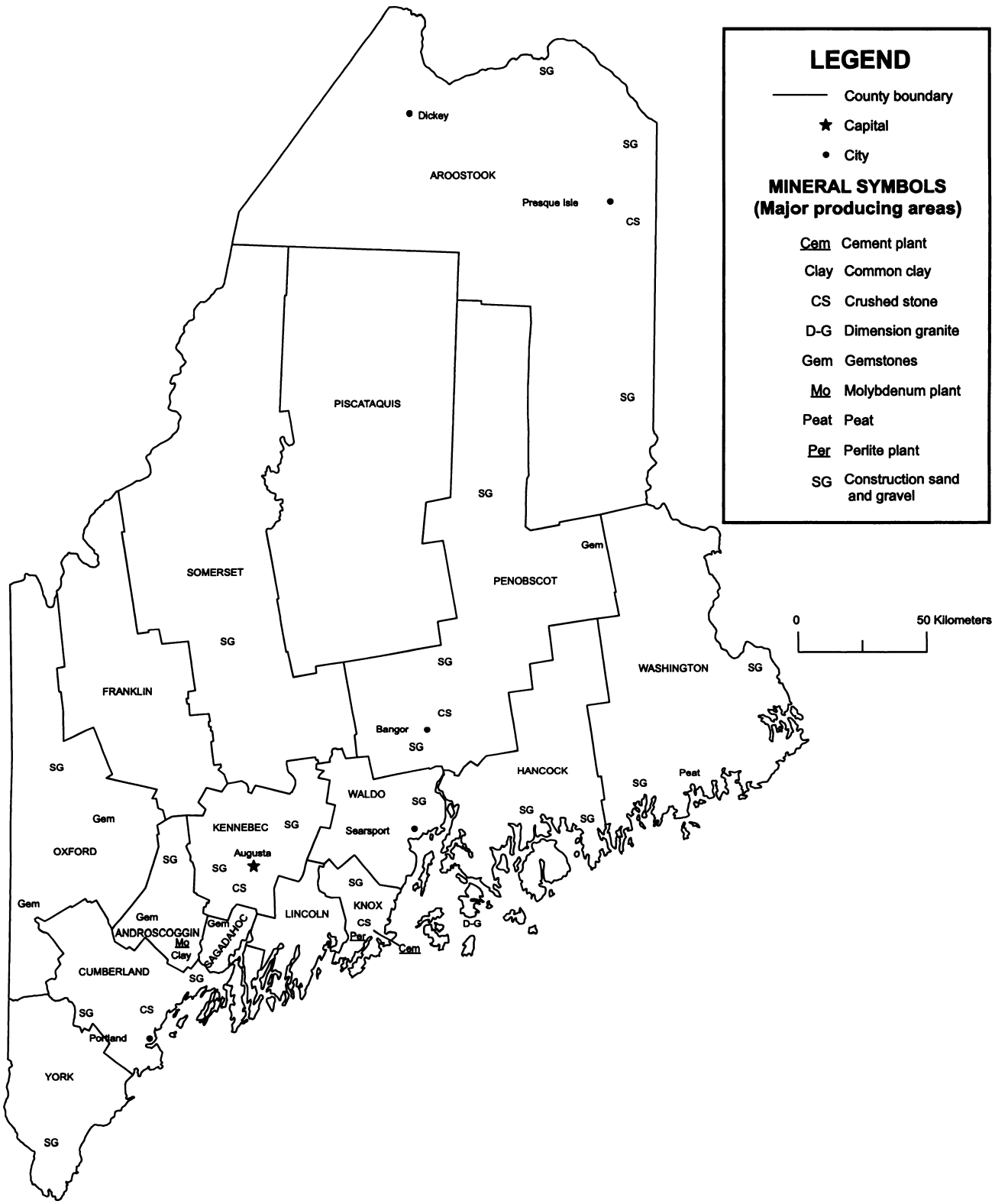
MAINE



Source: Maine Geological Survey/U.S. Geological Survey (2005)

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THE MINERAL INDUSTRY OF MAINE

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Maine Geological Survey for collecting information on all nonfuel minerals.

In 2005, Maine's nonfuel raw mineral production was valued[1] at $141 million, based upon annual U.S. Geological Survey data. This was a nearly 20% increase from that of 2004, which was up more than 10% from 2003. The large majority of the State's nonfuel mineral production resulted from the mining and production of construction minerals and materials—construction sand and gravel, portland cement, crushed stone, and dimension granite (descending order of value).

Construction sand and gravel and crushed stone accounted for nearly 63% of Maine's total nonfuel raw mineral production value in 2005. Increases in the values of portland cement and construction sand and gravel (up $8.3 million) led the State's increase in total value for the year (table 1).

In 2005, Maine remained 12th in the production of gemstones (based upon value) and significant quantities of construction sand and gravel were produced in the State. Modest increases took place in the production of most of the State's nonfuel mineral commodities.

The following narrative information was provided by the Maine Geological Survey[2] (MGS).

Exploration Activities

Freewest Resources Canada, Inc. optioned their Golden Ridge property to First Narrows Resources Corp. in 2002. Under this agreement, First Narrows completed a significant amount of drilling in 2004 on the New Brunswick side of the border, including gold intersections. The Golden Ridge property extends across the United States/Canada border into the Maine towns of Amity and Orient, south of Houlton. Because of increasing metal prices, the MGS received inquiries from mining companies for information and status of known mineral deposits in the State.

The only activity on State-owned land took place regarding a metal deposit claim held by International Paper in Somerset County in northwestern Maine. A 1-year renewal (7/2005-6/2006) was granted on the company's exploration claim at the 105-acre Alder Pond, beneath which extends a portion of a copper-lead-zinc-silver sulfide deposit. The renewal is for the purpose of allowing additional exploration activity. The deposit was estimated to be about 3.1 million metric tons. Exploration of the Alder Pond area has intermittently taken place since 1982, the first significant metal deposits of zinc and copper having been discovered in 1985 by BHP-Utah International Inc., a subsidiary of the Broken Hill Proprietary Co. Ltd. of Melbourne, Australia (Harrison, Anderson, and Foley, 1991, p. 228). Exploratory work from a 1996-98 drilling program done by Prospectors Alliance Corporation of Toronto, Ontario, Canada, in joint venture with International Larder Minerals, Inc., revealed that the orebody's main zone of about 508,000 metric tons of ore averaged 2.2% copper, 0.5% lead, 9% zinc, and 93 grams per metric ton silver. Within the main zone, there is a higher grade core of more than 165,000 metric tons (Maine Geological Survey, 2005§[3]). Development of the area has not as yet taken place based upon projected economic viability and estimated profitability of this potential project, yet interest in it is repeatedly fueled during periods of higher metal prices.

Commodity Review

Industrial Minerals

Gemstones.—The Mount Mica Mine in Paris was operated for gem tourmaline. This famous pegmatite deposit was discovered in 1820 and has been worked intermittently ever since. In 2005, it was yielding multicolored tourmalines, including gemstock and crystal specimens for collectors. Other pegmatite minerals also were recovered during the mining operation, such as quartz crystals, lapidary-grade masses of purple lepidolite mica, and occasional beryl crystals.

Other pegmatite deposits worked for gemstock and mineral specimens in 2005 included the Deer Hill amethyst mines in Stow (gemstock and specimens); Emmons Quarry and Noyes Mountain quarries in Greenwood (various collectible minerals); Fuller Mountain Quarry in Phippsburg (beryl crystals); Georgetown tourmaline mine; and Mount Marie Quarry in Paris (tourmaline etc.). Production from these and other Maine pegmatites was generally small and sporadic, primarily for mineral collectors and lapidaries.

Government Programs

In 2005, the MGS upgraded its Web site, adding an interactive map-based publications search capability to its online Bibliography of Maine Geology. Out-of-print maps and reports from all sources are included in the reference list returned to the user. This has greatly improved the ability to research literature on economic mineral deposits in Maine. The Web site also included links to Maine's mining rules, regulations, and statutes.

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[1]The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2005 USGS mineral production data published in this chapter are those available as of December 2006. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—can be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

[2]Robert G. Marvinney, Director and State Geologist, authored the text of the State mineral industry information provided by the Maine Geological Survey.

[3]A reference that includes a section mark (§) is found in the Internet Reference Cited section.

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Reference Cited

Harrison, D.K., Anderson, Walter, and Foley, M.E., 1991, The mineral industry of Maine, *in* Area Reports—Domestic: U.S. Bureau of Mines Minerals Yearbook 1989, v. II, p. 225-230.

Internet Reference Cited

Maine Geological Survey, 2005, Alder Pond massive sulfide deposit—Will mining return to Maine???, accessed May 10, 2007, at URL http://www.maine.gov/doc/nrimc/mgs/explore/mining/sites/nov05.htm.

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN MAINE[1, 2]

(Thousand metric tons and thousand dollars)

Mineral	2003		2004		2005	
	Quantity	Value	Quantity	Value	Quantity	Value
Clays, common	49 [e]	125 [e]	49	W	50	W
Gemstones	NA	262	NA	268	NA	272
Sand and gravel, construction	10,400	47,600	10,800	49,100	11,100	57,400
Stone, crushed	3,530	22,500	4,370	29,500	4,490	30,700
Combined values of cement (masonry [2003-04], portland), peat, stone (dimension granite), and values indicated by symbol W	XX	36,700	XX	39,300	XX	52,400
Total	XX	107,000	XX	118,000	XX	141,000

[e]Estimated. NA Not available. W Withheld to avoid disclosing company proprietary data. Withheld values included in "Combined values" data.
XX Not applicable.
[1]Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2]Data are rounded to no more than three significant digits; may not add to totals shown.

TABLE 2
MAINE: CRUSHED STONE SOLD OR USED, BY KIND[1]

Kind	2004			2005		
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Number of quarries	Quantity (thousand metric tons)	Value (thousands)
Limestone	4	1,680	$10,300	5	1,940	$12,500
Granite	6	1,980	14,300	6	1,730	12,400
Traprock	--	--	--	(2)	W	W
Quartzite	2	W	W	2	520	3,470
Slate	1	W	W	1	25	168
Miscellaneous stone	2	W	W	2	W	W
Total	XX	4,370	29,500	XX	4,490	30,700

W Withheld to avoid disclosing company proprietary data; included in "Total." XX Not applicable. -- Zero.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Sales/distribution yards.

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TABLE 3
MAINE: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2005, BY USE[1, 2]

(Thousand metric tons and thousand dollars)

Use	Quantity	Value
Construction:		
Coarse aggregate (+1½ inch):		
Riprap and jetty stone	45	382
Filter stone	W	W
Other coarse aggregate	29	302
Total	74	684
Coarse aggregate, graded:		
Concrete aggregate, coarse	163	962
Bituminous aggregate, coarse	(3)	(3)
Railroad ballast	(3)	(3)
Total	344	2,280
Fine aggregate (-⅜ inch):		
Stone sand, concrete	54	355
Stone sand, bituminous mix or seal	(4)	(4)
Other fine aggregate	45	389
Total	99	744
Coarse and fine aggregates:		
Graded road base or subbase	(5)	(5)
Other coarse and fine aggregates	1 890	13,400
Chemical and metallurgical:		
Cement manufacture	(3)	(3)
Lime manufacture	(3)	(3)
Total	804	4,600
Unspecified:[6]		
Reported	181	1,220
Estimated	1,100	7,800
Total	1 280	9,030
Grand total	4,490	30,700

W Withheld to avoid disclosing company proprietary data; included with "Other coarse aggregate."
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]To avoid disclosing company proprietary data, no district tables were produced for 2005.
[3]Withheld to avoid disclosing company proprietary data; included in "Total."
[4]Withheld to avoid disclosing company proprietary data; included with "Other fine aggregate."
[5]Withheld to avoid disclosing company proprietary data; included with "Other coarse and fine aggregates."
[6]Reported and estimated production without a breakdown by end use.

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TABLE 4
MAINE: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2005,
BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	873	$4,930	$5.64
Concrete products (blocks, bricks, pipe, decorative, etc.)	104	671	6.45
Asphaltic concrete aggregates and other bituminous mixtures	1,080	7,020	6.53
Road base and coverings	2,330	12,800	5.47
Road and other stabilization (cement and lime)	136	501	3.69
Fill	1,000	3,800	3.80
Snow and ice control	474	2,570	5.41
Other miscellaneous uses[2]	14	135	9.55
Unspecified:[3]			
Reported	760	3,680	4.85
Estimated	4,370	21,400	4.89
Total or average	11,100	57,400	5.16

[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes filtration and railroad ballast.
[3]Reported and estimated production without a breakdown by end use.

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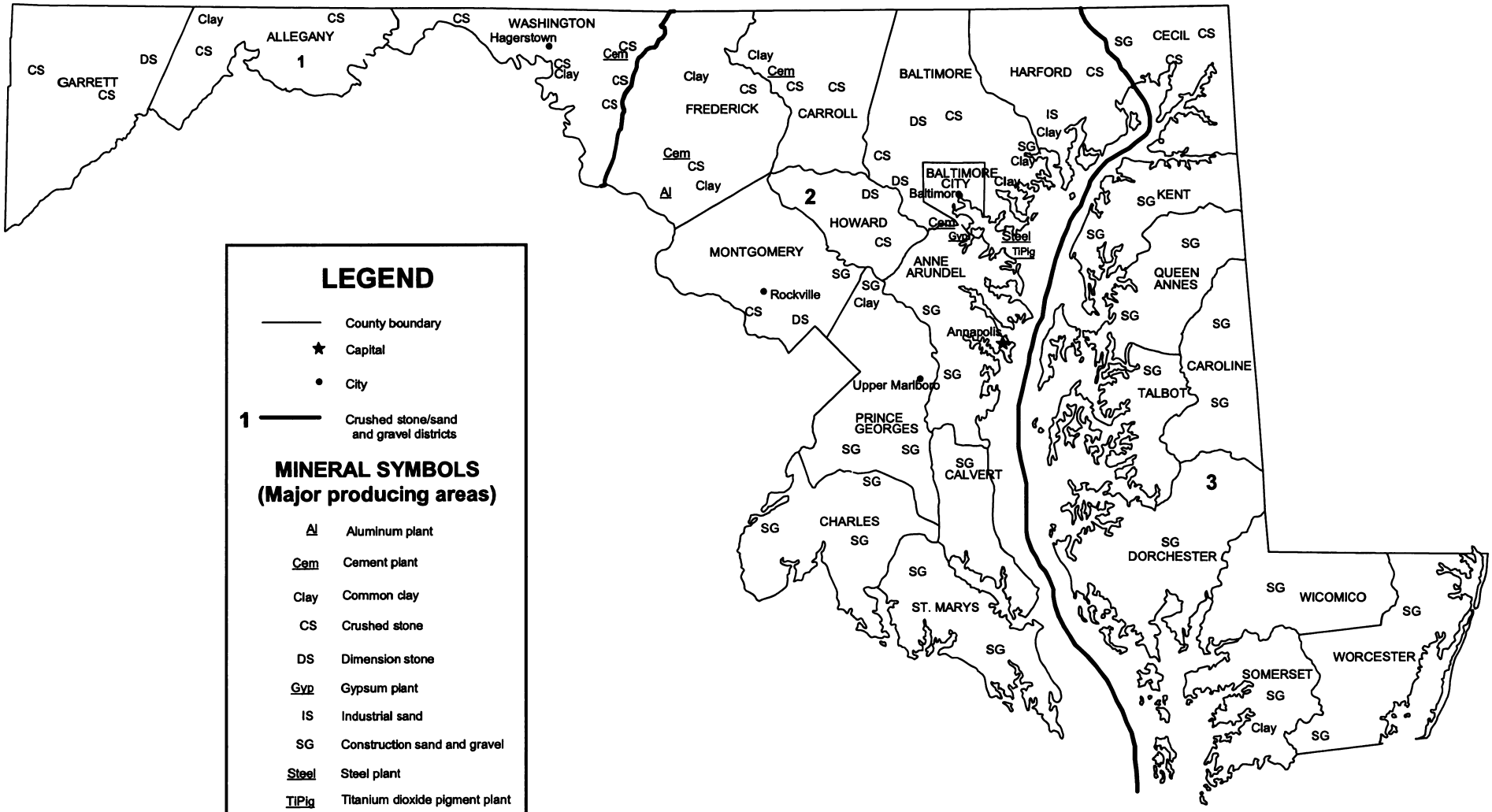
MARYLAND



Source: Maryland Department of the Enviornment/U.S. Geological Survey (2005)

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THE MINERAL INDUSTRY OF MARYLAND

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Maryland Department of the Environment, Minerals, Oil, and Gas Division, for collecting information on all nonfuel minerals.

In 2005, Maryland's nonfuel raw mineral production was valued[1] at $577 million, based upon annual U.S. Geological Survey (USGS) data. This was an increase of $103 million, up 21.7% from the State's total value of $474 million of 2004, which followed a $47 million or 11% increase from 2003 to 2004. The State ranked 33d among the 50 States in total nonfuel raw mineral production value and accounted for slightly more than 1% of the U.S. total value.

Crushed stone, portland cement, construction sand and gravel, and masonry cement, based upon value, were Maryland's leading nonfuel raw mineral commodities, the first three of which accounted for more than 99% of the State's reportable total nonfuel mineral value (table 1). Crushed marble, shell, and traprock, included in "Combined values" in table 1 for 2003, were included in the crushed stone data for 2004-05. (Because data for industrial sand and gravel and masonry cement (2004-05) were withheld (company proprietary data), the actual total values for those years are higher than those reported in table 1.)

In 2005, although crushed stone production was down about 6%, its $60 million rise in value, a 28% increase, led the way in Maryland's increase in total value.This was followed by increases in portland cement and construction sand and gravel values. Portland cement production rose 40%, accounting for a $35 million, or 20%, increase in value, and construction sand and gravel value was up $14 million, despite a small decrease in production (table 1). With a relatively small increase in production, the value of masonry cement significantly increased. Although production was only down slightly, the largest decrease in value was a $6.6 million drop in the value of dimension stone.

All nonfuel minerals mined in Maryland were industrial minerals. In 2005, the State continued to be a producer of significant quantities of crushed stone, portland cement, construction sand and gravel, dimension stone, and common clays (descending order of value), as compared with that of other producing States. All metal production, especially that of primary aluminum and raw steel, consisted of the processing and refining of materials received from other domestic and foreign sources. In 2005, Maryland remained eighth among 12 States in the production of primary aluminum. However, Eastalco Aluminum Co., the State's only producer of primary aluminum, closed its plant in Fredrick, MD, on December 19. Eastalco curtailed aluminum production, owing to unsuccessful attempts to secure a new, competitive supply of power for the facility with its then current supplier, Allegheny Power (Allegheny Energy, Inc.), or other power providers in the Maryland, New Jersey, and Pennsylvania market area that services the company (Alcoa, Inc., 2006§[2]).

The narrative information that follows was provided by the Maryland Department of the Environment's (MDE) Mining Program[3]. In 2005, Maryland's mining operations continued to be very active, overall following the same increasing production trends of the past several years.

Commodity Review

Industrial Minerals

Common Clays (Shale).—In Frederick County in the Piedmont area, Redland Brick Inc. added another 24 hectares (ha) (60 acres) of shale reserves to its mining operations in order to supply feed materials to its expanding Rocky Ridge moulded brick plant outside Thurmont in northern Frederick County. Redland also had a brick plant and shale reserves permitted near Williamsport in Washington County. Here at the company's Cushwa plant, authentic handmade brick was produced by experienced brickmakers, as well as machine-moulded face brick and pavers. The Cushwa line was Redland Brick's premier producer of special brick shapes and sizes (Redland Brick Inc., 2007§).

Construction Sand and Gravel.—Increasingly, materials were being produced for use in the more traditional construction markets. One new mining operation, Bayside Sand and Gravel, opened in 2005 with a 14-ha permit to mine bank run gravel in Worcester County to supply the growing construction demands of this southeastern Maryland county. The company's reserve of materials was being quickly consumed for use for local development needs, less so to the nearby vicinity's traditional beach replenishment. Another aggregate company in Worcester County, Pocomoke, LLC expanded its mining operation to keep up with the growing demand in the area. Pocomoke continued to produce very clean sand also being used in the area's building industry.

Crushed Stone.—The Arundel Corp. (a subsidiary of Florida Rock Industries, Inc.) began overburden stripping in preparation for its newly permitted 36-ha Reichlin property in Carroll County. The quarry is expected to supply limestone to central Maryland customers in 2007. The site includes several historical structures that will be preserved.

[1]The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2005 USGS mineral production data published in this chapter are those available as of December 2006. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—can be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

[2]References that include a section mark (§) are found in the Internet References Cited section.

[3]C. Edmon Larrimore, Program Manager of the Mining Program of the MDE, authored the text of the State mineral industry information provided by that agency.

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Internet References Cited

Alcoa, Inc., 2006, Alcoa to curtail Eastalco smelter on December 19 because of high power costs; company will continue to explore competitively-priced, long-term power, accessed August 9, 2007, at URL http://www.alcoa.com/global/en/news/news_detail.asp?pageID=20051123005210en&newsYear=2005.

Redland Brick Inc., 2007, With Cushwa brick products, your building really shapes up, accessed June, 18, 2007, at URL http://www.redlandbrick.com/cushwa.html.

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN MARYLAND[1, 2]

(Thousand metric tons and thousand dollars)

Mineral	2003		2004		2005	
	Quantity	Value	Quantity	Value	Quantity	Value
Cement, portland	2,200	147,000 e	2,520	175,000 e	3,550	210,000 e
Clays, common	269	550	262	571	317	686
Gemstones	NA	1	NA	1	NA	1
Sand and gravel, construction	11,800	79,900	12,700	75,500	12,300	89,500
Stone:						
Crushed	26,200 [3]	165,000 [3]	35,300 r	214,000 r	33,100	274,000
Dimension	24	2,700	27	9,580	26	3,010
Combined values of cement (masonry), sand and gravel (industrial), stone [crushed marble, shell, traprock (2003)]	XX	31,700	XX	(4) r	XX	(4)
Total	XX	427,000	XX	474,000 r	XX	577,000

eEstimated. rRevised. NA Not available. XX Not applicable.

[1]Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

[2]Data are rounded to three significant digits; may not add to totals shown.

[3]Excludes certain stones; kind and value included with "Combined values" data.

[4]Value withheld to avoid disclosing company proprietary data.

TABLE 2
MARYLAND: CRUSHED STONE SOLD OR USED, BY KIND[1]

Kind	2004			2005		
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Number of quarries	Quantity (thousand metric tons)	Value (thousands)
Limestone[2]	19	51,500 r	$133,000 r	18	21,400	$181,000
Granite	4	8,320	52,500	3	5,710	40,200
Marble	1	W	W	--	--	--
Sandstone	2	W	W	1	W	W
Shell	1	249	1,520	1	322	2,730
Traprock	2	3,320	15,800	2	W	W
Miscellaneous stone	1	W	W	--	--	--
Total	XX	35,300 r	214,000 r	XX	33,100	274,000

rRevised. W Withheld to avoid disclosing company proprietary data; included in "Total." XX Not applicable. -- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes limestone-dolomite reported with no distinction between the two.

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TABLE 3

MARYLAND: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2005, BY USE[1]

(Thousand metric tons and thousand dollars)

Use	Quantity	Value
Construction:		
Coarse aggregate (+1½ inch):		
Macadam	W	W
Riprap and jetty stone	485	3,850
Filter stone	W	W
Other coarse aggregates	862	4,260
Total	1,380	8,460
Coarse aggregate, graded:		
Concrete aggregate, coarse	777	4,970
Bituminous aggregate, coarse	1,730	14,000
Bituminous surface-treatment aggregate	215	2,020
Railroad ballast	142	1,090
Other graded coarse aggregates	2,560	35,800
Total	5,420	57,900
Fine aggregate (-⅜ inch):		
Stone sand, concrete	238	2,230
Stone sand, bituminous mix or seal	736	5,340
Screening, undesignated	99	579
Other fine aggregates	948	13,800
Total	2,020	21,900
Coarse and fine aggregates:		
Graded road base or subbase	3,530	27,200
Unpaved road surfacing	W	W
Crusher run or fill or waste	914	5,470
Roofing granules	W	W
Other coarse and fine aggregates	2,140	17,600
Total	7,000	52,500
Other construction materials[2]	(3)	(3)
Agricultural, limestone	(3)	(3)
Chemical and metallurgical:		
Cement manufacture	2,750	16,300
Flux stone	W	W
Sulfur oxide removal	W	W
Total	2,880	17,100
Other miscellaneous uses and specified uses not listed	173	2,270
Unspecified:[4]		
Reported	13,300	106,000
Estimated	481	4,100
Total	13,800	110,000
Grand total	33,100	274,000

W Withheld to avoid disclosing company proprietary data; included in "Total."

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes building products.

[3]Withheld to avoid disclosing company proprietary data; included in "Grand total."

[4]Reported and estimated production without a breakdown by end use.

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TABLE 4
MARYLAND: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2005, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Construction:						
Coarse aggregate (+1½ inch)[2]	W	W	W	W	W	W
Coarse aggregate, graded[3]	W	W	5,060	55,700	W	W
Fine aggregate (-⅜ inch)[4]	W	W	W	W	68	375
Coarse and fine aggregate[5]	W	W	4,460	36,200	W	W
Other construction materials[6]	--	--	W	W	--	--
Agricultural[7]	--	--	W	W	--	--
Chemical and metallurgical[8]	W	W	W	W	--	--
Other miscellaneous uses	--	--	173	2,270	--	--
Unspecified:[9]						
Reported	1,770	12,700	8,930	71,800	2,620	21,700
Estimated	--	--	159	1,300	322	2,700
Total	4,620	30,000	24,400	212,000	4,100	32,300

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes filter stone, macadam, riprap and jetty stone, and other coarse aggregate.

[3]Includes concrete aggregate (coarse), bituminous aggregate (coarse), bituminous surface-treatment aggregate, railroad ballast, and other graded coarse aggregate.

[4]Includes screening (undesignated), stone sand (bituminous mix or seal), stone sand (concrete), and other fine aggregate.

[5]Includes crusher run or fill or waste, graded road base or subbase, unpaved road surfacing, roofing granules, and other coarse and fine aggregates.

[6]Includes building products.

[7]Includes limestone.

[8]Includes cement manufacture, flux stone, and sulfur oxide removal.

[9]Reported and estimated production without a breakdown by end use.

TABLE 5
MARYLAND: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2005, BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	7,600	$56,500	$7.43
Plaster and gunite sands	153	1,330	8.69
Asphaltic concrete aggregates and other bituminous mixtures	237	1,620	6.85
Road base and coverings[2]	339	2,510	7.42
Fill	553	2,590	4.69
Other miscellaneous uses[3]	293	2,270	7.72
Unspecified:[4]			
Reported	2,340	14,400	6.14
Estimated	837	8,300	9.92
Total or average	12,300	89,500	7.25

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes road base and other stabilization (cement).

[3]Includes snow and ice control and filtration.

[4]Reported and estimated production without a breakdown by end use.

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TABLE 6

MARYLAND: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2005, BY USE AND DISTRICT[1, 2]

(Thousand metric tons and thousand dollars)

Use	Districts 1 and 2		District 3	
	Quantity	Value	Quantity	Value
Concrete aggregate (including concrete sand)[3]	4,240	35,400	3,510	22,500
Asphaltic concrete aggregates and road base materials[4]	554	4,020	22	115
Fill	284	1,480	270	1,120
Other miscellaneous uses[5]	18	210	275	2,050
Unspecified:[6]				
Reported	2,320	14,100	18	223
Estimated	837	8,300	--	--
Total	8,250	63,500	4,090	26,000

-- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Districts 1 and 2 are combined to avoid disclosing company proprietary data.

[3]Includes plaster and gunite sands.

[4]Includes road and other stabilization (cement).

[5]Includes snow and ice control and filtration.

[6]Reported and estimated production without a breakdown by end use.

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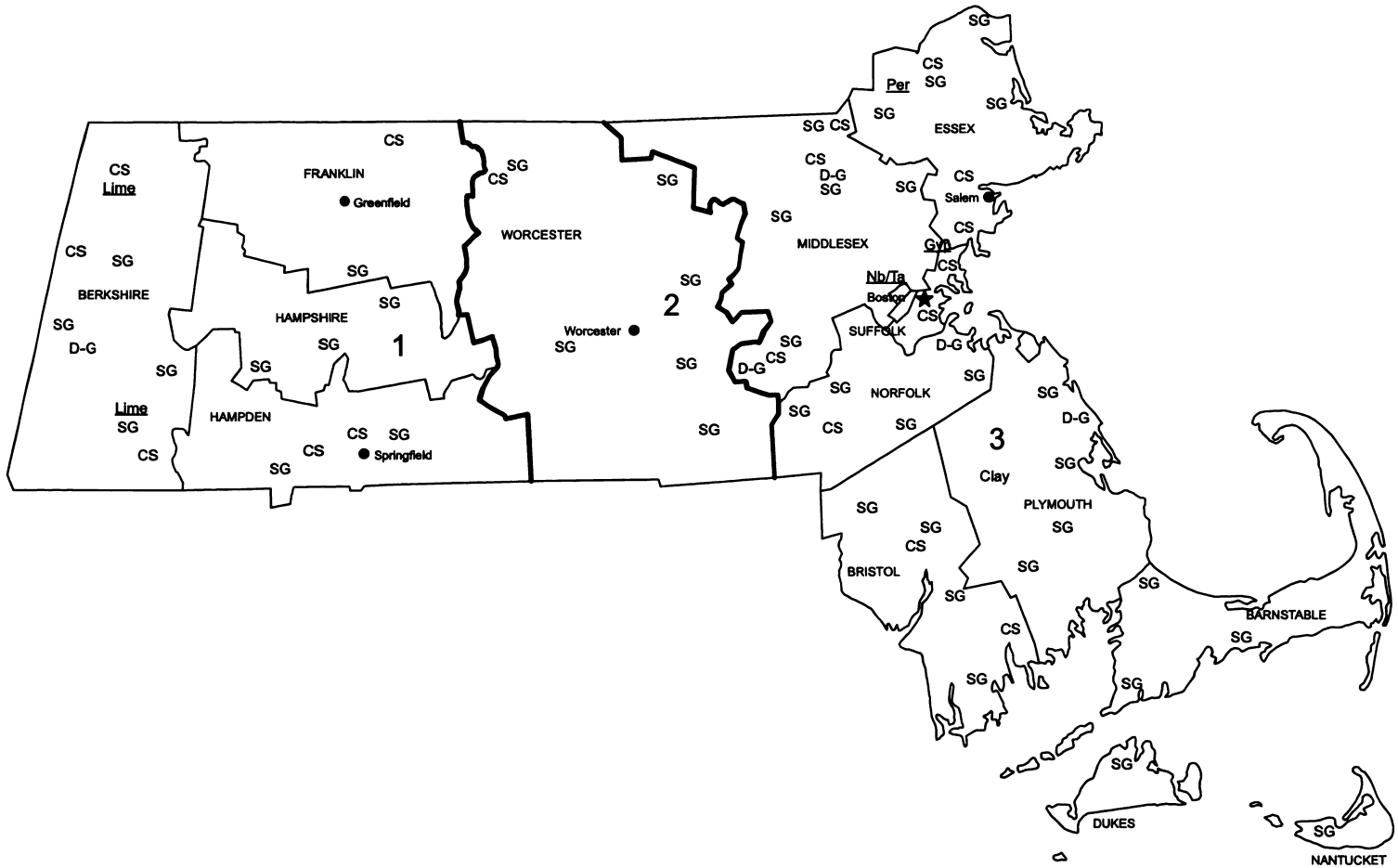
MASSACHUSETTS



LEGEND

- County boundary
- Capital
- City
- 1 — Crushed stone/sand and gravel districts

MINERAL SYMBOLS

(Major producing areas)

Clay	Common clay
CS	Crushed stone
D-G	Dimension granite
Gyp	Gypsum plant
Lime	Lime plant
Nb/Ta	Columbium/tantalum plant
Per	Perlite plant
SG	Construction sand and gravel

0 20 Kilometers

Source: Massachusetts Executive Office of Environmental Affairs/U.S. Geological Survey (2005)

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THE MINERAL INDUSTRY OF MASSACHUSETTS

In 2005, Massachusetts nonfuel raw mineral production was valued[1] at $250 million, an 18.5%, or a $39 million increase from that of 2004, based upon annual U.S. Geological Survey data. This followed a 3.4% increase in the State's total nonfuel mineral production value for 2004 from that of 2003, which was up 3% from 2002.

Massachusetts leading nonfuel mineral commodities in descending order of value were crushed stone, construction sand and gravel, and lime, the former two commodities accounting for about 95% of the State's total value. Because data for lime and common clays (2004-05) have been withheld, the State's actual total nonfuel mineral values for 2003-05 are higher than those reported in table 1.

Construction sand and gravel led the State's increase in value moving the commodity significantly closer to being the State's leading nonfuel mineral. A nearly 15% increase in production resulted in a 30%, or $27 million, increase in value to $117 million in 2005, bringing the nonfuel mineral commodity to within $4 million of the total value of crushed stone. With a slight decrease in production, crushed stone value rose by $12 million to $121 million (table 1). With the same quantity produced as in 2004, dimension stone value was down slightly and gemstones value was unchanged. With a slight drop in production, the value of lime increased by more than $1 million. Common clays value was up slightly.

In 2005, the State remained fifth in the quantities of dimension stone produced; additionally, the quarries and sand pits in Massachusetts continued to produce significant quantities of crushed stone and construction sand and gravel when compared with the other producing States.

[1]The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2005 USGS mineral production data published in this chapter are those available as of December 2006. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—can be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN MASSACHUSETTS[1,2]

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral	2003		2004		2005	
	Quantity	Value	Quantity	Value	Quantity	Value
Clays, common	36	321	36	(3)	37	(3)
Gemstones	NA	1	NA	1	NA	1
Lime	W	(3)	W	(3)	W	(3)
Sand and gravel, construction	12,900	80,800	14,400	90,000	16,500	117,000
Stone:						
Crushed	13,000	111,000	13,700 r	109,000	13,200	121,000
Dimension	81	11,300	82	11,600	82	11,500
Total	XX	204,000	XX	211,000	XX	250,000

rRevised. NA Not available. W Withheld to avoid disclosing company proprietary data. XX Not applicable.
[1]Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2]Data are rounded to three significant digits; may not add to totals shown.
[3]Value excluded to avoid disclosing company proprietary data.

TABLE 2
MASSACHUSETTS: CRUSHED STONE SOLD OR USED, BY KIND[1]

Kind	2004			2005		
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Number of quarries	Quantity (thousand metric tons)	Value (thousands)
Limestone[2]	2	983	$15,300	2	1,000	$16,000
Dolomite	1	W	W	1	W	W
Granite	9	3,830 r	29,200 r	9	3,850	30,900
Traprock	18	8,390 r	59,700 r	18	7,830	68,600
Miscellaneous stone	1	W	W	1	W	W
Total	XX	13,700 r	109,000	XX	13,200	121,000

rRevised. W Withheld to avoid disclosing company proprietary data; included in "Total." XX Not applicable.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes limestone-dolomite reported with no distinction between the two.

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TABLE 3

MASSACHUSETTS: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2005, BY USE[1]

(Thousand metric tons and thousand dollars)

Use	Quantity	Value
Construction:		
Coarse aggregate (+1½ inch):		
Riprap and jetty stone	W	W
Other coarse aggregates	W	W
Coarse aggregate, graded:		
Concrete aggregate, coarse	W	W
Other graded coarse aggregates	W	W
Fine aggregate (-⅜ inch), other fine aggregates	W	W
Coarse and fine aggregates:		
Graded road base or subbase	67	550
Unpaved road surfacing	(2)	(2)
Crusher run or fill or waste	(2)	(2)
Total	375	4,250
Other construction materials[3]	98	2,120
Agricultural:		
Agricultural limestone	W	W
Poultry grit and mineral food	W	W
Chemical and metallurgical:		
Lime manufacture	W	W
Dead burned dolomite	W	W
Flux stone	W	W
Special:		
Whiting or whiting substitute	W	W
Other fillers or extenders	W	W
Unspecified:[4]		
Reported	5,150	47,700
Estimated	6,900	55,000
Total	12,000	103,000
Grand toal	13,200	121,000

W Withheld to avoid disclosing company proprietary data; included in "Grand total."

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Withheld to avoid disclosing company proprietary data; included in "Total."

[3]Includes building products.

[4]Reported and estimated production without a breakdown by end use.

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TABLE 4
MASSACHUSETTS: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2005, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Construction:						
Coarse aggregate (+1½ inch)[2]	W	W	W	W	W	W
Coarse aggregate, graded[3]	W	W	W	W	W	W
Fine aggregate (-⅜ inch)[4]	W	W	W	W	W	W
Coarse and fine aggregates[5]	W	W	W	W	W	W
Other construction materials[6]	98	2,120	--	--	--	--
Agricultural[7]	W	W	--	--	--	--
Chemical and metallurgical[8]	W	W	--	--	--	--
Special[9]	W	W	--	--	--	--
Unspecified:[10]						
Reported	1,670	13,300	1,160	9,270	2,320	25,200
Estimated	528	4,200	1,000	8,400	5,300	42,000
Total	2,980	31,700	2,210	17,600	8,030	72,100

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes macadam, filter stone, riprap and jetty stone, and other coarse aggregate.

[3]Includes concrete aggregate (coarse), bituminous aggregate (coarse), bituminous surface-treatment aggregate, railroad ballast, and other graded coarse aggregate.

[4]Includes stone sand (concrete), stone sand (bituminous mix or seal), and other fine aggregate.

[5]Includes crusher run or fill or waste, graded road base or subbase, unpaved road surfacing, and other coarse and fine aggregates.

[6]Includes building products.

[7]Includes agricultural limestone and poultry grit and mineral food.

[8]Includes lime manufacture, dead-burned dolomite, and flux stone.

[9]Includes whiting or whiting substitute and other fillers or extenders.

[10]Reported and estimated production without a breakdown by end use.

TABLE 5
MASSACHUSETTS: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2005, BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	2,680	$25,300	$9.43
Plaster and gunite sands	93	1,060	11.39
Concrete products (blocks, bricks, pipe, decorative, etc.)	45	404	9.03
Asphaltic concrete aggregates and other bituminous mixtures	998	8,150	8.16
Road base and coverings[2]	1,580	8,460	5.36
Fill	2,050	9,730	4.75
Snow and ice control	337	2,380	7.05
Other miscellaneous uses[3]	423	2,250	5.33
Unspecified:[4]			
Reported	884	6,860	7.76
Estimated	7,370	52,500	7.13
Total or average	16,500	117,000	7.12

[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

[2]Includes road and other stabilization (lime).

[3]Includes railroad ballast and filtration.

[4]Reported and estimated production without a breakdown by end use.

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TABLE 6

MASSACHUSETTS: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2005, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregates and concrete products[2]	521	5,290	547	3,330	1,750	18,200
Asphaltic concrete aggregates and road base materials[3]	209	1,920	1,750	11,200	622	3,490
Fill	467	1,650	391	1,350	1,190	6,730
Snow and ice control	12	88	122	755	204	1,540
Other miscellaneous uses[4]	11	84	412	2,170	--	--
Unspecified:[5]						
Reported	649	3,520	--	--	235	3,350
Estimated	1,080	7,510	1,570	10,900	4,720	34,100
Total	2,950	20,100	4,790	29,700	8,720	67,400

-- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes plaster and gunite sands.

[3]Includes road and other stabilization (lime).

[4]Includes filtration and railroad ballast.

[5]Reported and estimated production without a breakdown by end use.

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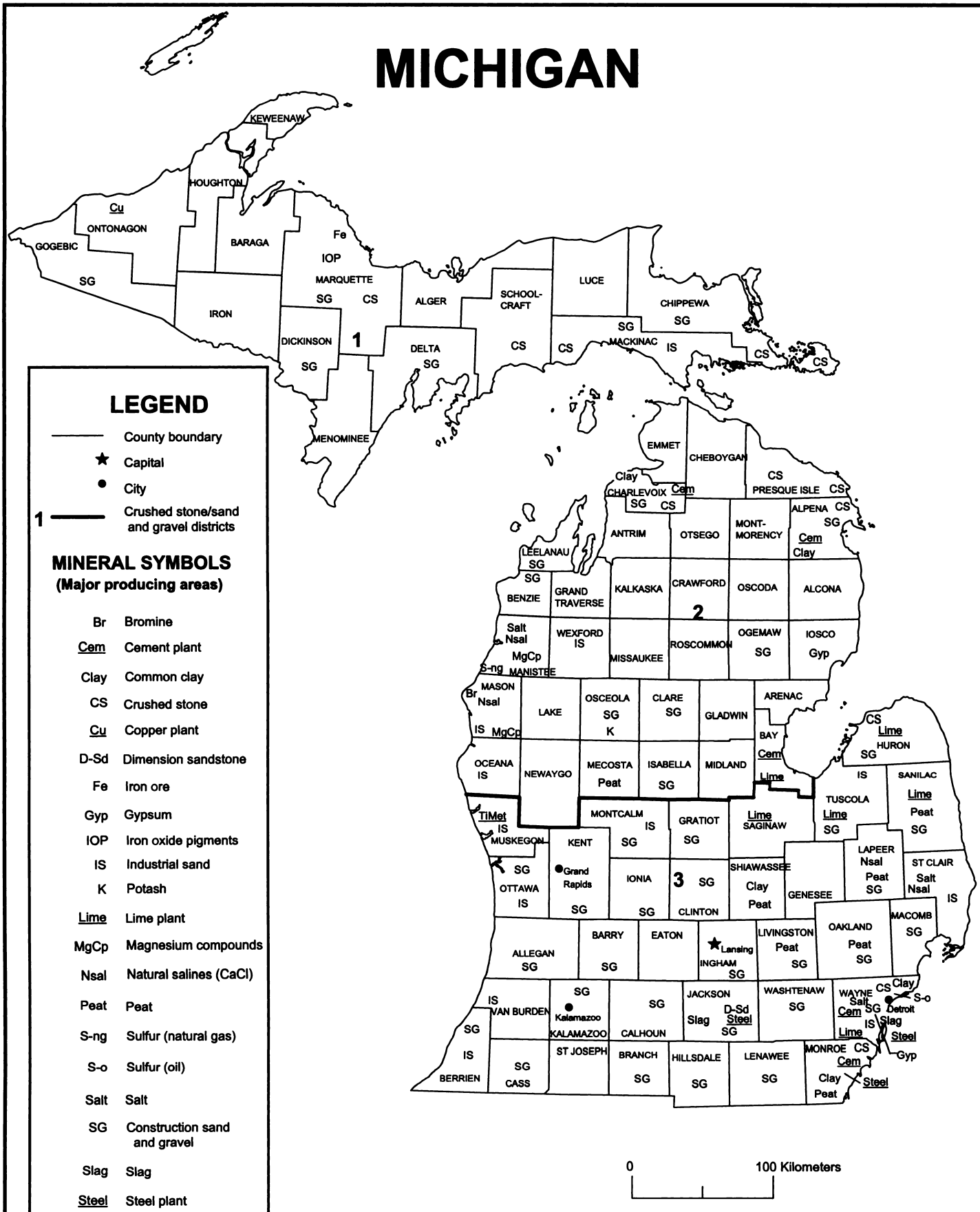
MICHIGAN



LEGEND

- County boundary
- ★ Capital
- ● City
- 1 Crushed stone/sand and gravel districts

MINERAL SYMBOLS
(Major producing areas)

Br	Bromine
Cem	Cement plant
Clay	Common clay
CS	Crushed stone
Cu	Copper plant
D-Sd	Dimension sandstone
Fe	Iron ore
Gyp	Gypsum
IOP	Iron oxide pigments
IS	Industrial sand
K	Potash
Lime	Lime plant
MgCp	Magnesium compounds
Nsal	Natural salines (CaCl)
Peat	Peat
S-ng	Sulfur (natural gas)
S-o	Sulfur (oil)
Salt	Salt
SG	Construction sand and gravel
Slag	Slag
Steel	Steel plant
TiMet	Titanium metal plant

Source: Michigan Department of Environmental Quality, Office of the Geological Survey/U.S. Geological Survey (2005)

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THE MINERAL INDUSTRY OF MICHIGAN

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Michigan Department of Environmental Quality, Office of the Geological Survey, for collecting information on all nonfuel minerals.

In 2005, Michigan's nonfuel raw mineral production was valued[1] at $1.75 billion, based upon annual U.S. Geological Survey (USGS) data. This was a $70 million, or 4.2% increase from the State's total nonfuel mineral value for 2004, which then had increased by $100 million, or up 6.3% from 2003 to 2004. The State was 11th in rank (ninth in 2004) among the 50 States in total nonfuel mineral production value, of which Michigan accounted for more than 3% of the U.S. total.

In 2005, Michigan continued to be the Nation's second leading iron ore-producing State, and, based upon value, iron ore remained Michigan's leading nonfuel mineral commodity, followed by portland cement. (After decades of iron ore being the State's leading nonfuel mineral commodity, portland cement led the State in total nonfuel mineral value from 1999-2003.) Following portland cement were, in descending order of value, construction sand and gravel, salt, crushed stone, magnesium compounds, masonry cement, and lime. The values of these nonfuel mineral commodities, combined, accounted for 96% of the State's nonfuel raw mineral production value (table 1).

In 2005, portland cement and iron ore led Michigan's increase in nonfuel mineral production value. Although portland cement production was down slightly, its value rose by more than $50 million from that of 2004. The unit value of iron ore also rose. With a relatively small decrease in iron ore production, the value of iron ore shipments rose by more than $15 million. Other mineral commodities with significant increases in value were those of magnesium compounds, lime, crude gypsum, and potash, all increases ranging from about $15 million for magnesium compounds to about $4 million for potash. The unit values of five of these six nonfuel mineral commodities had significant increases in unit value except for magnesium compounds, which was up only slightly, and crude gypsum. An increase in crude gypsum production of 130% resulted in a 90% increase in the commodity's value. The most substantial decreases in value were those of salt and construction sand and gravel, down about $15 million and $11 million, respectively (table 1).

In 2005, Michigan continued to be first in the quantities of magnesium compounds produced and second in iron ore, bromine (of two bromine-producing States), peat, and second of four States that produce iron oxide pigments (mineral commodities listed in descending order of value). The State also remained third of three States that produce potash, fourth in construction sand and gravel, sixth in industrial sand and gravel, seventh in salt, and ninth in masonry cement. The State rose to 9th from 10th in gypsum production but decreased to 5th from 4th in the production of portland cement. Additionally, the State was a significant producer of crushed stone, lime, and common clays. Michigan rose to third from fourth in the Nation in the manufacture of raw steel, with an increase in output to 6.05 million metric tons (Mt) in 2005 from an output of about 5.84 Mt in 2004 (American Iron and Steel Institute, 2006, p. 76).

The following narrative information was provided by the Michigan Department of Environmental Quality (MDEQ), Office of the Geological Survey (MOGS), the Michigan Department of Natural Resources (MDNR), and the Forestry, Mineral, and Fire Management Division[2] (FMFM). Production and other data and information in the following text are those reported by the MOGS and the MDNR, based upon those agencies' own research, surveys, and estimates. Mineral production data may differ from some production figures reported to the USGS.

Exploration and Development

In 2005, metallic and nonmetallic minerals continued to be produced from Federal, State, and privately owned lands; their production remained an important business activity within the State. Mineral commodities produced from these lands were supplied to local, regional, and international markets.

Kennecott Minerals Co. (a subsidiary of London-based Rio Tinto Plc with headquarters in Salt Lake City, UT) continued to conduct prefeasibility studies in 2005 at its Eagle Project nickel-copper sulfide deposit. Studies included an assessment of the environmental, social, and economic impacts of a proposed mine, as well as a review of engineering proposals for the mine. Participating in the discussion and planning process associated with these studies was a community advisory group. The company planned to conclude these studies by the end of the year, and then enter into an advanced feasibility stage that would include submission of permit applications to further develop the mine. The proposed Eagle Mine in northern Marquette County could require an estimated investment of $100 million and employ about 120 full-time workers (Kennecott Minerals Company, 2005).

Bitterroot Resources Ltd., West Vancouver, British Columbia, Canada, announced plans for the first phase of its joint venture with Cameco Corp., Saskatoon, Saskatchewan, Canada, to determine availability of mineral resources in the Upper

[1]The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2005 USGS mineral production data published in this chapter are those available as of December 2006. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—can be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

[2]The text of the State mineral industry information was compiled and edited by Milton A. Gere, Jr., Geologist and Supervisor, Metallic and Nonmetallic Minerals and Underground Gas Storage Leasing Unit, Minerals and Land Management Section, Forest, Mineral, and Fire Management Division, Michigan Department of Natural Resources, and Joseph R. Maki, Geologist, Office of the Geological Survey, Michigan Department of Environmental Quality.

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Peninsula of Michigan. Ground-based electromagnetic surveys were to be used to test near-surface conductive zones previously identified by an airborne geophysical survey conducted in 2004. The extent of test drilling of the lands was to be determined following receipt of the geophysical survey results. According to the joint–venture agreement, Cameco was to provide all funding for the 2005 exploration program and Bitterroot would remain the project operator (Bitterroot Resources Ltd., 2005).

JML Resources Ltd., Toronto, Ontario, Canada, announced in late August an agreement to acquire Aquila Resources Inc., a Toronto-based, privately held company. Aquila's principal asset was the Back Forty, a project to develop a volcanogenic massive sulfide resource in Menominee County, Michigan. Previous exploration results from the Back Forty project identified an inferred resource of 3.1 Mt grading 6.8% zinc, 0.25% copper, 32 grams per metric ton (g/t) silver, and 2.0 g/t gold (JML Resources Ltd., 2005).

Commodity Review

Industrial Minerals

Industrial Sand and Gravel.—Nugent Sand Co. applied for an MDEQ permit to continue its sand-mining operation at Norton Shores through 2012. Nugent planned to dredge 1.6 million cubic meters (2.1 million cubic yards) of sand and enlarge a 21-hectare (ha) (53-acre) manmade lake by another 8.5 ha (21 acres). The company had stopped mining on part of their property and had proposed to develop home sites around the manmade lake. A regional environmental group, however, opposed the issuance of the permit until a decision was made on Nugent's request for a permit to install a wastewater pipeline through a shoreline sand dune (Alexander, 2005). The request for the pipeline was denied by the MDEQ in early December. The pipeline, as proposed, would have allowed Nugent to discharge the water from its high-grade sand processing plant into Lake Michigan. In addition, the pipeline would have allowed for regulation of water levels in the manmade lake (Alexander and Burns, 2005).

The Ottawa County commissioners approved the purchase of a 3.2-kilometer (2-mile) long North Ottawa Dune property from Construction Aggregates Corp. in October. The price paid for the property was $7 million, a figure that was about $2.5 million below the property's appraised value. Closing costs of $100,000 were also incurred by the County in completing the purchase transaction. Funds for the purchase were provided through the Michigan Natural Resources Trust Fund, the County, and private fundraising. The County planned to begin a master plan for its use of the property in 2006 (Chandler, 2005).

Construction Sand and Gravel.—In January 2005, Rieth-Riley Construction Co. objected to the use of aerial photos prior to a vote by the Ada Township (Kent County) Zoning Board of Appeals that rejected Rieth-Riley's request for expansion of their operation. The photos reportedly revealed certain company violations, one of which included stockpiling of materials beyond designated areas. The company's attorney stated that they were not aware the photos would be presented prior to the vote. Thus, they could not prepare an appropriate response to the zoning commissioner's determination that Rieth-Riley had unlawfully expanded their local operation. The Township Board subsequently passed a resolution to further investigate the company's operations (Cunningham, 2005).

Holcim Ltd., Zurich, Switzerland, announced an agreement to purchase Aggregate Industries Plc, Markfield, United Kingdom. Aggregate Industries has numerous aggregate operations in the United States, and operates several sand and gravel, and related businesses in Michigan. Holcim operates the Dundee Cement Co. in western Monroe County. The agreement would give Holcim additional presence in the United States and United Kingdom aggregate and cement markets and would make Holcim the world's second leading cement producer (Rock Products, 2005a§[3]).

Limestone and Dolomite.—Oglebay-Norton Co., Cleveland, OH, emerged from bankruptcy protection effective January 31, 2005 (Rock Products, 2005b§). Later the company announced that all of its limestone and lime operations would operate under the name O-N Minerals, effective May 1, 2005. The new division included all the Michigan Limestone Operations and Global Stone locations (Skillings Mining Review, 2005b). In October, the company announced that O-N Minerals had entered into an agreement allowing Western Lime Corp. lease land at O-N's Port Inland, MI, operation to construct and operate a lime kiln. O-N would supply the stone and Western would produce high-calcium lime for the environmental and industrial markets. Operation of the kiln was planned to begin in 2007 (Oglebay-Norton Co., 2005§).

Metals

Copper.—HudBay Minerals Inc., Winnipeg, Manitoba, Canada, announced in October that it had exercised an option to acquire 100% ownership of White Pine Copper Refinery Inc., White Pine, MI. The U.S. $13 million purchase was to close in late 2005 or early 2006. White Pine has been refining copper anodes produced from HudBay's operations in northern Manitoba, and will continue to do so upon completion of the acquisition (Hudbay Minerals, Inc., 2005).

Iron Ore.—Cleveland-Cliffs Inc., (CCI), Cleveland, OH, continued to produce iron ore pellets at its partially owned Tilden Mine and Empire Mine operated in Marquette County, Michigan. Iron and steel producer Stelco Inc., Hamilton, Ontario, Canada, partial owner of the Tilden Mine and user of a significant quantity of iron ore pellets from the mine each year, remained under bankruptcy protection during the year. After filing several restructuring plans during the year, Stelco, in December, received final approval from creditors of restructuring plans (Daily Commercial News, 2006§).

Government Activities, Legislation, and Programs

Metallic mineral leases issued during fiscal year 2005 ending September 30, 2005, totaled 118 and covered 11,190 ha (27,650 acres) of land. An additional 85 leases covering 8,500 ha (21,000 acres) were awaiting issuance, pending finalization of

[3]References that include a section mark (§) are found in the Internet References Cited section.

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a revised lease document expected to be completed in 2006. Another three lease applications covering 1,330 ha (3,280 acres) were still under field review at the end of the year. Fees obtained from the various metallic mineral leases provided revenue of $172,633 to the State in fiscal year 2005 (Thomas B. Hoane, Senior Geologist, MDNR, FMFM, Mineral and Land Management Section (MLMS), Metallic Mineral Leasing Program, unpublished Fiscal Year 2005 Annual Report, January 2006).

Nonmetallic mineral leases issued during fiscal year 2005 totaled 31 and extended over 1,000 ha (2,470 acres). The leases issued pertained to a variety of mineral commodities, including boulders, clay, cobblestone, construction sand, gravel, limestone and dolomite, and salt. Twenty of the leases went to County Road Commissions for sand and gravel, the result of converting short-term permits to multiyear leases. Six nominations for conversion to multiyear leases also were received in fiscal year 2005. The remaining permits and the various leases provided revenue of $333,167 to the State for fiscal year 2005 (Thomas B. Hoane, Senior Geologist, MDNR, FMFM, MLMS, Nonmetallic Mineral Leasing Program, unpublished Fiscal Year 2005 Annual Report, January 2006).

The MDEQ, MOGS, in late 2004 announced new language for metallic mining permits that included the potential mining of metallic sulfide-bearing minerals. The permitting process as described in "Michigan's Nonferrous Metallic Mine Regulations," falls within the provisions of the Natural Resources Protection Act, Act 451 of 1994, Part 632, as amended. Specific rules for the new permitting process were developed in 2005 as a result of the combined input, review, and consensus by a large committee of representatives of numerous stakeholders. The rules were scheduled to be completed and promulgated in early 2006. The comprehensive, progressive mining law covering such new mining permits had been incorporated into Public Act Number 449 of 2004, granting exclusive authority to the MDEQ to regulate underground and surface mining and reclamation for nonferrous metals. This law contains a permitting process that requires a baseline assessment, detailed plans for mining, reclamation, and responding to accidents; a provision for public input; and assurance of financial support to cover remediation and reclamation costs in the event the MDEQ must take over those activities. Also, upon completion of mining, the site and surrounding area must be reclaimed to establish a self-sustaining ecosystem that does not require perpetual care or post-closure monitoring. The law includes strict, comprehensive, civil and criminal enforcement tools (Skillings Mining Review, 2005a).

Three exploration plans were approved in fiscal year 2005 and one was pending completion of review and approval in early fiscal year 2006 by the MDNR for work on State metallic mineral leases located in the western half of the Upper Peninsula (Thomas B. Hoane, Senior Geologist, MDNR, FMFM, MLMS, Metallic Mineral Leasing Program, unpublished Fiscal Year 2005 Annual Report, January 2006).

U.P. Steel, located at the former Eagle Mills Manufacturing, LLC facility, Negaunee, MI, was selected to receive a $530,000 Michigan Energy Efficiency Grant from the State Public Service Commission. The company planned to further develop the commercial conversion of iron ore to steel using a microwave process. The initial microwave process is under license from Michigan Technological University, (MTU)- Houghton. Two MTU Institute of Material Sciences professors developed the microwave process. The process could possibly make high phosphorus iron ore usable and involve fewer steps and lower costs than using conventional iron ore processing (Grand Rapids Press, The, 2005).

A retired MTU professor received a contract from the MDNR to continue efforts to update the Abandoned Underground Mine Inventory. Minesite visitations and meetings with several county mine inspectors and interested parties were held to record changes in site conditions resulting from new subsidence and discoveries, and site safety repairs on mines of all ownerships. The MDNR also continued the process to make safety repairs at old mine sites located on State-owned mineral rights areas.

More information about the MDNR is available on the Web site at URL http:www.michigan.gov/dnr; information and maps related to State-owned lands and minerals and leasing are available on the site. Information and maps related to State environmental and mining regulations, geological programs, and offered publications are available on the MDEQ Web site at URL http://www.michigan.gov/deq.

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TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN MICHIGAN[1, 2]

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral	2003		2004		2005	
	Quantity	Value	Quantity	Value	Quantity	Value
Cement, masonry	237	24,300 e	231	27,100 e	228	27,500 e
Clays, common	588	3,050	605	3,070	334	514
Gemstones	NA	1	NA	1	NA	1
Gypsum, crude	500	6,130	452	5,660	1,050	10,700
Peat	125	3,460	122	3,360	117	3,300
Sand and gravel:						
Construction	71,000	253,000	69,500	254,000	64,800	243,000
Industrial	2,130	31,400	1,690	25,200	1,610	24,500
Stone, crushed	33,600 [3]	123,000 [3]	36,700 r, 3	143,000 r, 3	36,100	141,000
Combined values of bromine, cement (portland), iron ore (usable shipped), iron oxide pigments (crude), lime, magnesium compounds, potash, salt, stone (crushed marl and miscellaneous [2003], crushed marl [2004], dimension dolomite and sandstone)	XX	1,140,000	XX	1,210,000 r	XX	1,300,000
Total	XX	1,580,000	XX	1,680,000 r	XX	1,750,000

eEstimated. rRevised. NA Not available. XX Not applicable.
[1]Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2]Data are rounded to no more than three significant digits; may not add to totals shown.
[3]Excludes certain stones; kind and value included with "Combined values" data.

TABLE 2
MICHIGAN: CRUSHED STONE SOLD OR USED, BY KIND[1]

Kind	2004			2005		
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Number of quarries	Quantity (thousand metric tons)	Value (thousands)
Limestone	22	27,900	$105,000	25	27,900	$108,000
Dolomite	5	7,860	35,300	5	7,380	31,200
Calcareous marl	1	W	W	1	(2)	(2)
Miscellaneous stone	1	941	3480	2	(2)	(2)
Total	XX	36,700 r	143,000 r	XX	36,100	141,000

rRevised. W Withheld to avoid disclosing company proprietary data. XX Not applicable.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Withheld to avoid disclosing company proprietary data; included in "Total."

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TABLE 3

MICHIGAN: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2005, BY USE[1]

(Thousand metric tons and thousand dollars)

Use	Quantity	Value
Construction:		
Coarse aggregate (+1½ inch):		
Macadam	W	W
Riprap and jetty stone	126	2,020
Filter stone	W	W
Other coarse aggregate	77	497
Total	235	2,830
Coarse aggregate, graded:		
Concrete aggregate, coarse	4,250	20,200
Bituminous aggregate, coarse	439	3,390
Bituminous surface-treatment aggregate	W	W
Railroad ballast	W	W
Other graded coarse aggregate	1,140	5,220
Total	5,930	29,700
Fine aggregate (-⅜ inch):		
Stone sand, concrete	W	W
Stone sand, bituminous mix or seal	450	1,880
Screening, undesignated	W	W
Other fine aggregate	336	1,520
Total	1,300	5,290
Coarse and fine aggregates:		
Graded road base or subbase	1,910	9,500
Unpaved road surfacing	77	416
Crusher run or fill or waste	169	649
Other coarse and fine aggregates	370	1,730
Total	2,520	12,300
Other construction materials	1	3
Agricultural:		
Limestone	W	W
Other agricultural uses	W	W
Total	106	984
Chemical and metallurgical:		
Cement manufacture	W	W
Lime manufacture	W	W
Flux stone	W	W
Total	7,570	19,800
Special, other fillers or extenders	W	W
Other miscellaneous uses and specified uses not listed	889	1,330
Unspecified:[2]		
Reported	16,000	62,200
Estimated	1,600	6,200
Total	17,600	68,400
Grand total	36,100	141,000

W Withheld to avoid disclosing company proprietary data; included in "Total."

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Reported and estimated production without a breakdown by end use.

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TABLE 4
MICHIGAN: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2005, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Construction:						
Coarse aggregate (+1½ inch)[2]	W	W	W	W	154	2,310
Coarse aggregate, graded[3]	W	W	W	W	W	W
Fine aggregate (-⅜ inch)[4]	W	W	W	W	W	W
Coarse and fine aggregate[5]	W	W	W	W	1,650	8,290
Other contruction materials	--	--	1	3	--	--
Agricultural[6]	W	W	W	W	W	W
Chemical and metallurgical[7]	W	W	W	W	--	--
Special[8]	--	--	W	W	--	--
Other miscellaneous uses	889	1,330	--	--	--	--
Unspecified:[9]						
Reported	--	--	9,320	36,300	6,670	25,900
Estimated	--	--	116	457	1,500	5,700
Total	10,500	41,300	13,700	43,300	11,900	56,000

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes filter stone, macadam, riprap and jetty stone, and other coarse aggregate.
[3]Includes bituminous aggregate (coarse), bituminous surface-treatment aggregate, concrete aggregate (coarse), railroad ballast, and other graded coarse aggregate.
[4]Includes stone sand (concrete), stone sand bituminous mix or seal, screening (undesignated), and other fine aggregate.
[5]Includes crusher run or fill or waste, graded road base or subbase, unpaved road surfacing, and other coarse and fine aggregates.
[6]Includes agricultural limestone and other agricultural uses.
[7]Includes cement manufacture, flux stone, and lime manufacture.
[8]Includes other fillers or extenders.
[9]Reported and estimated production without a breakdown by end use.

TABLE 5
MICHIGAN: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2005, BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	7,570	$34,000	$4.49
Plaster and gunite sands	32	358	11.14
Concrete products (blocks, bricks, pipe, decorative, etc.)	243	723	2.97
Asphaltic concrete aggregates and other bituminous mixtures	3,780	15,100	4.00
Road base and coverings	5,050	20,400	4.03
Road and other stabilization (cement and lime)	296	1,360	4.60
Fill	6,810	16,000	2.35
Snow and ice control	346	1,390	4.02
Filtration	36	294	8.21
Other miscellaneous uses[2]	108	626	5.80
Unspecified:[3]			
Reported	7,320	28,100	3.84
Estimated	33,200	124,000	3.75
Total or average	64,800	243,000	3.75

[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.
[2]Includes railroad ballast.
[3]Reported and estimated production without a breakdown by end use.

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TABLE 6

MICHIGAN: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2005, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products[2]	305	2,400	833	3,280	6,710	29,400
Asphaltic concrete aggregates and other bituminous mixtures	128	484	1,070	4,170	2,590	10,500
Road base and coverings[3]	725	2,660	1,950	7,280	2,670	11,800
Fill	168	288	461	1,050	6,180	14,700
Snow and ice control	57	124	161	431	128	837
Other miscellaneous uses[4]	17	85	15	122	111	714
Unspecified:[5]						
Reported	28	103	118	560	7,170	27,500
Estimated	1,150	4,320	3,600	13,500	28,500	107,000
Total	2,580	10,500	8,200	30,400	54,000	202,000

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes plaster and gunite sands.

[3]Includes road and other stabilization (cement and lime).

[4]Includes filtration and railroad ballast.

[5]Reported and estimated production without a breakdown by end use.

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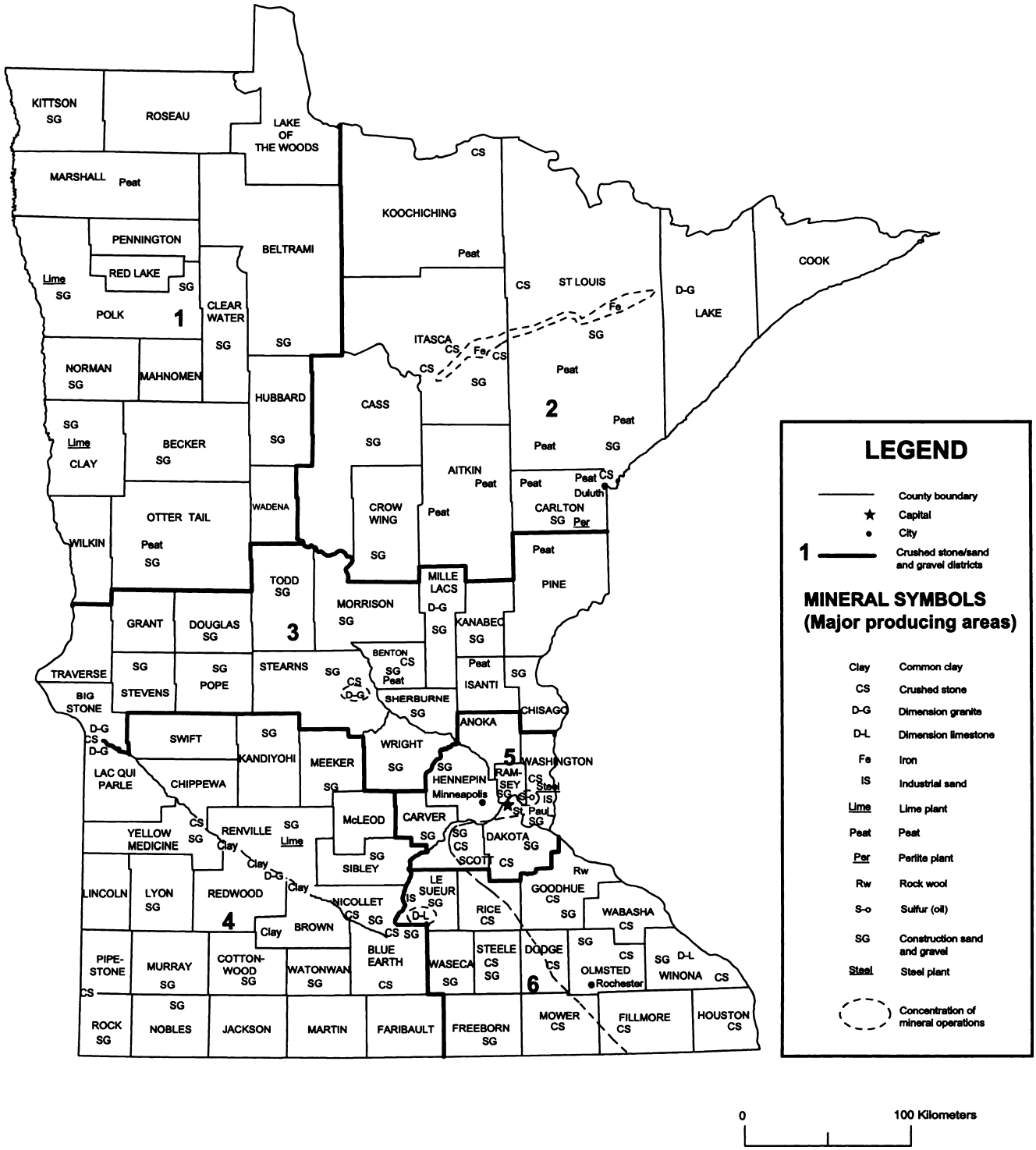
MINNESOTA



Source: Minnesota Department of Natural Resources, Division of Lands and Minerals/U.S. Geological Survey (2005)

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The Mineral Industry of Minnesota

In 2005, Minnesota's nonfuel raw mineral production was valued[1] at $2.19 billion, based upon annual U.S. Geological Survey (USGS) data. This was a $310 million, or 16.5%, increase from the State's total nonfuel mineral value for 2004, which had increased by $560 million, or more than 42%, from 2003 to 2004. Minnesota continued to rank seventh among the 50 States in total nonfuel mineral production value, and the State accounted for 4% of the U.S. total. [Because data for industrial sand and gravel and lime have been withheld (company proprietary data), the actual total values for 2003-05 are noticeably higher than those reported in table 1.]

Minnesota continued to be the Nation's leading iron ore-producing State in 2005, and, based upon value, iron ore continued to be the State's leading nonfuel mineral, accounting for nearly 84% of its total nonfuel mineral production value. Iron ore was followed by construction sand and gravel, crushed stone, industrial sand and gravel, dimension stone, lime, peat, common clays, and gemstones (in descending order of value).

The State's substantial increase in nonfuel raw mineral production value largely resulted from iron ore's considerably higher average price per metric ton (t) in 2005 compared with that of 2004. In 2005, despite a 2% decrease in production shipments, the commodity's value rose by more than $270 million, or by 17%, compared with that of 2004. This was the second consecutive year in which the value of iron ore increased significantly; in 2004, with a 22% increase in production shipments, the commodity's value rose by more than $530 million, or by more than 50%, compared with that of 2003. Other commodities with particularly significant increases in value were crushed stone and construction sand and gravel. With a marginal increase in the production of crushed stone and despite a 1.5% decrease in that of construction sand and gravel, the values of these commodities rose by $22 million (34%) and $18 million (nearly 8%), respectively. The values of industrial sand and gravel and lime were also up by more than 40% each. Although dimension stone production decreased by 14%, the production value for 2005 increased by $1 million, or 8%. An increase in peat production and a slight increase in its unit value led to an increase in the value of peat (table 1).

In 2005, Minnesota continued to rank first among other producing States in the quantity of iron ore produced, third in the production of peat, and fifth in construction sand and gravel. The State rose in rank to eighth from ninth in the production of industrial sand and gravel, and comparatively significant quantities of dimension stone were produced in the State.

The following narrative information was provided by the Minnesota Department of Natural Resources' (DNR) Division of Lands and Minerals (MDLM).[2] Production data in the following text are those reported by the MDLM, based upon its own surveys and estimates. The data may differ from some production figures reported by the USGS. In 2005, mining in Minnesota actively continued in the traditional nonfuel mineral sectors, and a variety of new mineral-related research and mineral exploration activities took place in the State. Identified deposits of such mineral resources as construction aggregates, dimension stone, direct-shipping grade iron ore, manganese, peat, stone (landscaping), and titanium allowed for prospective opportunities for new mineral development in the State. Minnesota geologically has potential for the occurrence of such mineral resources as base metals and precious metals, diamond, and kaolin, as well as for oil and gas. The level of investment in mineral development activity was significantly higher than in the past few years and many additional mineral development investment opportunities continued to exist in the State.

Exploration and Development Activities

There were 194 active State metallic minerals leases in Minnesota, covering slightly more than 27,100 hectares (ha) (67,050 acres) as of December 31, 2005. No State metallic minerals lease sales were held in 2005, but 71 leases were awarded through the State's negotiated lease and preference rights processes. Four of these were issued to Lehman Exploration Management, Inc. and encompassed 690 ha in Itasca County. Two, issued to Kennecott Exploration Company (227 ha), were in Kanabec County; two, issued to Prime Meridian Resources, Inc. (389 ha), were in Koochiching County, and four, issued to Kennecott Exploration Company (372 ha), were in Mille Lacs County. The remaining 59 leases were all located in St. Louis County—49 of them (encompassing in total 5,020 ha) were issued to Encampment Resources LLC, and the remaining 10 leases (1,740 ha) were issued to 608457 B.C. Ltd.

A total of 21 leases (nearly 1,880 ha) were terminated in 2005. Four of these (encompassing 100 ha) were located in Lake County, and the other 17 (1,780 ha) were located in St. Louis County.

A number of State-sponsored research projects related to mineral resources were underway in Minnesota in 2005. The University of Minnesota Duluth—Natural Resources Research Institute (UMD-NRRI) supported exploration geochemistry projects for base metals, diamond, and precious metals. The Minnesota Geological Survey (MGS), in cooperation with a private partner, was completing a statewide exploration geochemical survey for diamond. In another MGS project, original aeromagnetic survey data were being reanalyzed to produce more currently useful digital products. The MGS also was preparing a report on the use of lithogeochemical principles to identify zones of platinum-group element (PGE) concentration in mafic intrusions. Lithogeochemical analysis

[1]The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2005 USGS mineral production data published in this chapter are those available as of December 2006. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—can be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

[2]Maryanna Harstad, Senior Planner, authored the text of the State mineral industry information provided by the Minnesota Department of Natural Resources' Division of Lands and Minerals.

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of alteration zoning could prove valuable in identifying PGE enrichment zones in Minnesota mafic intrusions that are not part of the Duluth Complex.

Industrial Minerals

The industrial mineral and construction materials mining industry in Minnesota, as categorized by the MDLM, was composed of the production of seven general categories of commodities: aggregate, clays, granite, industrial silica sand, limestone, peat, and quartzite. Mineral resources were identified within the State to develop additional mine sites for most of these commodities. Minnesota's population continued to grow, presenting the need for more of these materials. During the period 1990 to 2000, Minnesota's population grew by an average of 54,000 per year, and the State's population in 2000 was 4,919,000 (according to the 2000 U.S. census). Minnesota was the fastest growing State in the Midwest and the Northeast during that period. In 1998, the population of the Greater Twin Cities Metropolitan Area, including surrounding counties, exceeded 3 million. Different modes of transportation were available for producers in the State to move industrial mineral commodities to various markets: Mississippi River barges to carry material to the Gulf of Mexico; bulk carriers to carry material to Lower Lake ports; railroad to transport material to either coast; and trucks to transport material via the interstate highway system. During 2005, all these factors—significant mineral potential, a growing population, and an effective transportation infrastructure—continued to create opportunities for development of industrial mineral resources in Minnesota.

Metals

Nonferrous Metallic Leasing and Exploration.—In 2005, advanced stage exploration continued at two copper-nickel-PGE deposits near the western margin of Late Proterozoic-age mafic intrusions collectively referred to as the Duluth Complex. The two deposits were the NorthMet deposit, which was being explored by Polymet Mining Corp., and the Birch Lake deposit, which was being explored by Franconia Minerals Corp.

Polymet Mining completed its nearly 29,000-meter (m) (95,000-foot) infill drilling program and bulk sample drilling. The bulk samples were used to test the flotation and hydrometallurgical equipment and processes proposed for the metal extraction project. The pilot plant sample processing, completed by SGS Lakefield Research Ltd. (Canada), later confirmed the technical feasibility of the planned flotation and hydrometallurgical treatment processes. In addition, Polymet's wetland mitigation program received support from the local county board (Polymet Mining Corp., 2008§[3]).

The Birch Lake property was the main site of an advanced stage exploration project, which also included the Maturi and Spruce Road properties. The drilling of 40 holes and 49 wedges totaling more than 33,300 m has outlined a large tonnage, low-grade copper-nickel-PGE deposit at Birch Lake in a resource area of approximately 260 ha. The ore was contained in the upper portion of an ultramafic unit within the South Kawishiwi intrusive at a depth of 350-750 m. During 2005, infill drilling of four holes with six associated wedges totaling more than 4,000 m revealed a higher grade zone of mineralization and confirmed the general continuity of the deposit. Several intercepts assayed greater than 1% copper and about 2 grams per metric ton (g/t) of combined platinum/palladium. A 2002 estimate of inferred mineral resources (using a hydrometallurgical case and a net smelter return cutoff of $25.35 per metric ton) described 51 million metric tons (Mt) of inferred resources at a grade of 0.675% copper, 0.211% nickel, 0.01% cobalt, and 2.6 parts per million (ppm) silver, 972 parts per billion (ppb) palladium, 460 ppb platinum, and 216 ppb gold. Mineralization consisted of disseminated sulfides with palladium to platinum ratios of 2:1 in drill-core analyses (Franconia Minerals Corp., 2008§).

Another copper-nickel deposit, the Mesaba project near Babbitt in northeastern Minnesota, which is held by Teck Cominco, Ltd., has been dormant since Polymet Mining reached an agreement with Cliffs-Erie L.L.C. for use of the nearby former LTV Steel Mining Co.'s mining and plant facilities. The mine and plant were to be designed around Teck Cominco's hydrometallurgical process.

Wallbridge America Corp. proposed the drilling of as many as 13 core holes in its Maturi Extension copper-nickel property in the Lake County part of the Duluth Complex. Drilling was planned to begin in the spring of 2006.

In other exploration activities, Kennecott Minerals Co. drilled 18 core holes totaling nearly 4,200 m in mafic-ultramafic features outside the Duluth complex in Carlton, Kanabec, Mille Lacs, Morrison, and Stearns Counties. Kennecott also performed additional geophysical surveys over its target in Aitkin and Carlton Counties.

The MDLM maintains an archive of drill core and related exploration data at its office in Hibbing, St. Louis County. Scanned copies of these archives may be accessed through the DNR's Web site at URL http://minarchive.dnr.state.mn.us.

Commodity Review

Industrial Minerals

Clay and Shale.—Clay was produced from seven mines (four of which were opened after 1995) for two general purposes. Kaolin was mined for use in portland cement production and for the production of bricks and tiles. Common clay and shale were also mined for bricks and tiles.

Construction Aggregate (Construction Sand and Gravel and Crushed Stone).—Construction aggregate was or has in past years been mined in all of the State's 87 counties. Construction aggregate production in Minnesota included three general categories of material: sand and gravel mined from glacial deposits or alluvial deposits; crushed dolomite or limestone mined from bedrock in southeastern Minnesota; and crushed rock mined elsewhere from diabase, gabbro, gneiss, granite, quartzite, rhyolite, taconite, and trap rock. The materials were used for many construction purposes: asphalt pavement, precast concrete products, railroad ballast, ready-mixed concrete, riprap, road base, stone (landscape), and other

[3]References that include a section mark (§) are found in the Internet References Cited section.

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fill material. Some of the same quarries that produced crushed carbonate rock also produced granular carbonate (limestone or dolomite) rock, which was used for soil amendment or in the manufacture of cement.

Each year, millions of tons of potential byproducts from taconite mining are stockpiled and reclaimed. The UMD-NRRI was leading a 3-year $1.6 million program to accelerate the use of taconite byproducts in larger quantities for construction aggregates for Minnesota and other States.

The DNR maintains a Web site for information about Minnesota aggregate resources at URL http://www.dnr.state.mn.us/lands_minerals/aggregatemaps.html. The site includes such items as aggregate resource maps for twelve counties; the seven-county Minneapolis St. Paul metropolitan area aggregate resource map and a related report by the MGS and the Minneapolis St. Paul Metropolitan Council on the projected availability of aggregate resources; and the final report to the Minnesota Legislature of the Aggregate Resources Task Force from February 1, 2000.

Dimension Stone.—Dimension stone production in Minnesota included granite, limestone, and quartzite. Two granite producers operated nine quarries within the State near the cities or towns of Babbitt, Bellingham, Isle, Morton, Ortonville, and St. Cloud. Dimension stone end products generally were of two categories: building stone and memorials. The building stone products included interior and exterior facing, paving and curbing tile, countertops, and furniture. The memorial stone products included monuments, markers, mausoleums, and crypt fronts. Three limestone producers operated eight quarries within the State in the vicinity of Mankato and Winona. The limestone was commonly used to produce building stone products. Quartzite was quarried near Jasper in southwestern Minnesota and was used for abrasive products and dimensional products. Abrasive products included grinding media cubes and pebbles. Dimensional products included acid-resistant blocks, building stone, memorials, and mill and chute liners. Cold Spring Granite Co.'s green stone, Lake Superior Green, was used in the National D-Day Memorial in Bedford, VA, and the company's black stone, Mesabi Black, has significantly increased in popularity in recent years. The National Museum of the American Indian, Washington, DC, which opened in September 2004, contains two types of stone from Minnesota. Pipestone, a soft red and pink stone called catlinite, was mined in the State and carved into ceremonial pipes for Native Americans around the United States and Canada by a private individual producer, and Oneota dolomite was produced by Vetter Stone Co. under the trade name Kasota-Mankato stone (Cecil, 2005§).

Landscape stone products have become a popular and valuable commodity in the Twin Cities area. Many dolomite quarries offered landscape stone products, and the New Ulm Quartzite Quarry offered purple quartzite landscape stone products. Natural glacial boulders and smaller fieldstone were supplied from many sources from as far away as the Mesabi Iron Range. Cliffs Natural Stone sells a line of landscape stone products obtained from various sources on the eastern Mesabi Iron Range. Cliffs Natural Stone has a State lease for a stockpile of flagstone material near Hoyt Lakes. Various types of State-owned stockpile material are sold to local companies for use as construction aggregates, such as road base material and as landscape stone. State leases continue to be available from many other stockpiles along the 140 kilometers (90 miles) of the Mesabi Iron Range.

Limestone, Agricultural.—The Minnesota Department of Agriculture (MDA) analyzes the granular carbonate soil amendment, commonly called agricultural limestone, or ag-lime, to report the neutralization potential. The analytical data for every ag-lime producer is available on the MDA Web site at URL http://www.mda.state.mn.us by searching for "Ag-lime analysis report." The MDA compilation lists 2004 total sales in Minnesota of more than 741,000 t (817,000 short tons) of ag-lime, of which 47%, or more than 348,000 t (384,000 short tons) was primary production from Minnesota quarries.

Peat.—Peatlands occur throughout Minnesota except in the extreme southwestern and southeastern corners of the State. The majority of the State's approximately 2.4 million ha (6 million acres) of peatland (about 50% in public ownership) occurs in the northern half of the State. Minnesota also contains the largest deposit of sphagnum peat of the lower 48 States. Horticultural peat was commercially mined primarily in the northern half of the State, and the products are used mainly in the gardening, greenhouse, and landscaping industries. Seven companies held peat leases on State lands. Ten companies were regulated under the Permit to Mine program, which consisted of operations larger than 16 ha (40 acres); the extent of these operations totaled approximately 1,780 ha (4,400 acres) of peatland.

Special Silica Stone.—Silica sand, from sandstone bedrock formations east of the Twin Cities and north of Mankato, was used in the petroleum industry, in the construction industry, in foundries, in glassmaking, and for sand blasting.

Metals

Iron Ore.—Minnesota continued to rank first in the Nation in iron ore production in 2005 and accounted for about 76% of domestic iron ore production and shipments to the U.S. steel industry (table 1). Iron-ore pellet production continued to rank among the State's leading industries, contributing more than $1 billion annually to Minnesota's economy. Based upon USGS annual production data, iron ore production in 2005 in Minnesota totaled nearly 40.6 Mt (table 1). The MDLM estimated that iron ore production in 2006 would show a small increase and that production for 2007 would likely also be very close to industry capacity.

Increased profits and an improved steel market in the past several years have allowed Minnesota's six iron ore operations to implement mine and plant improvements. United States Steel Corp. completed the construction of two new wet scrubbers. The first became operational in early 2006 at the company's Keewatin Taconite plant and the second was brought online in June 2006 at the Minntac plant. At these operations, iron-bearing taconite rock is mined and processed into taconite pellets for use in steelmaking. The new scrubbers allowed the operators to substitute western coal or biomass for natural gas to fuel the pellet furnaces, resulting in an energy cost savings.

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Cleveland-Cliffs Inc. announced plans to restart two long-idled pellet lines at Northshore Mining and United Taconite. United Taconite's Line 1 pellet furnace, shut down since 1999, was reactivated during the second quarter of 2005. Northshore's Line 5 pellet furnace had not operated since the shutdown of Reserve Mining Co. in 1986. Cleveland-Cliffs planned to restart the idled furnace by the first quarter of 2008.

Minnesota Steel Industries LLC planned to construct an integrated steelmaking facility near Nashwauk, Itasca County. The project was planned to include a taconite mine, concentrator, pellet plant, direct-reduced iron plant, and an electric furnace steelmaking facility. This will be the only single-site integrated steelmaking operation in North America. Environmental review, as well as permitting for the facility, began in January 2005. The draft environmental impact statement was due to be published in February 2007. Construction was expected to begin in 2007, with production planned for 2009.

Government Programs and Activities

Environmental and Technological Research Programs

The MDLM's Environmental Cooperative Research Program addresses environmental and land use impacts associated with mining. Typical research projects are cosponsored by industry, Federal agencies, or other units of government on a cost-share or in-kind service basis (Minnesota Department of Natural Resources Division of Lands and Minerals, 2002§). Projects during 2005 included various studies designed to reduce mercury emissions from taconite plants. The State of Minnesota's most recent biennial appropriation (July 2005 to June 2007) for mineral cooperative environmental research was $172,000; matching monies or in-kind contributions were a requirement of the appropriation process.

The MDLM's Iron Ore Cooperative Research Program funds research supporting rapid improvements in iron ore and taconite processing. Research projects funded during the July 2005 to June 2007 biennium included taconite concentrator modeling, novel methods for improving filtration, and blast vibration mapping. The State appropriation was $550,000 per biennium.

The MDLM also was responsible for managing the Minerals Diversification Program, which funds research supporting the long-term health of the State's mining economy. This is intended to be achieved through improvements to the existing industry and by encouraging environmentally sound exploration for and development of new mineral resources. Research projects funded during the most recent biennium included bedrock and quaternary geology of the Mesabi Range (scheduled for completion in June 2006) and compilation of U.S. Steel exploration data. The State biennial appropriation for this program was $344,000.

Availability of State Mineral Industry Data

Drill core and other exploration information may be found under the title of "Public Access to Minerals Information" at URL http://minarchive.dnr.state.mn.us. The DNR Web site (at URL www.dnr.state.mn.us) includes such information as monthly data releases; information on mineral lease availability; aggregate resource maps, including a seven county Minneapolis St. Paul metropolitan area aggregate resource map and report on projected availability of aggregate resources; and many online documents pertaining to mineral and mining research and exploration.

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TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN MINNESOTA[1, 2]

(Thousand metric tons and thousand dollars)

Mineral	2003		2004		2005	
	Quantity	Value	Quantity	Value	Quantity	Value
Clays, common	20	22	20	22	20	22
Gemstones	NA	6	NA	6	NA	6
Iron ore, usable shipped	34,000	1,030,000	41,400	1,560,000	40,600	1,830,000
Lime	W	(3)	W	(3)	W	(3)
Peat	60	5,070	63	5,210	68	5,670
Sand and gravel:						
Construction	48,900	212,000	54,900	235,000	54,100	253,000
Industrial	W	(3)	W	(3)	W	(3)
Stone:						
Crushed	9,880	61,800	10,400 r, 4	64,900 r, 4	10,500	86,900
Dimension	16	11,900	22	12,400	19	13,400
Total	XX	1,320,000	XX	1,880,000 r	XX	2,190,000

rRevised. NA Not available. W Withheld to avoid disclosing company proprietary data. XX Not applicable.
[1]Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2]Data are rounded to no more than three significant digits; may not add to totals shown.
[3]Value excluded to avoid disclosing company proprietary data.
[4]Excludes certain stones; value excluded to avoid disclosing company proprietary data.

TABLE 2
MINNESOTA: CRUSHED STONE SOLD OR USED, BY KIND[1]

Kind	2004			2005		
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Number of quarries	Quantity (thousand metric tons)	Value (thousands)
Limestone	35	4,220 r	$23,900 r	36	3,440	$28,400
Granite	4	2,510 r	16,000 r	4	2,690	22,100
Dolomite	6	3,670	25,100	6	3,920	32,800
Quartzite	1	W	W	1	419	3,570
Total	XX	10,400 r	64,900 r	XX	10,500	86,900

rRevised. W Withheld to avoid disclosing company proprietary data. XX Not applicable.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.

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TABLE 3

MINNESOTA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2005, BY USE[1]

(Thousand metric tons and thousand dollars)

Use	Quantity	Value
Construction:		
Coarse aggregate (+1½ inch):		
Macadam	W	W
Riprap and jetty stone	88	1,540
Filter stone	200	1,790
Coarse aggregate, graded:		
Concrete aggregate, coarse	(2)	(2)
Bituminous aggregate, coarse	(2)	(2)
Bituminous surface-treatment aggregate	(2)	(2)
Railroad ballast	(2)	(2)
Total	1,030	9,190
Fine aggregate (-⅜ inch):		
Stone sand, bituminous mix or seal	(2)	(2)
Screening, undesignated	(2)	(2)
Other fine aggregate	1	6
Total	235	2,030
Coarse and fine aggregates:		
Graded road base or subbase	1,150	8,890
Unpaved road surfacing	(3)	(3)
Crusher run or fill or waste	47	177
Other coarse and fine aggregates	67	424
Total	1,270	9,490
Agricultural, limestone	W	W
Unspecified:[4]		
Reported	2,290	18,700
Estimated	5,300	44,000
Total	7,600	62,500
Grand total	10,500	86,900

W Withheld to avoid disclosing company proprietary data; included in "Grand total."

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Withheld to avoid disclosing company proprietary data; included in "Total."

[3]Withheld to avoid disclosing company proprietary data; included with "Other coarse and fine aggregates."

[4]Reported and estimated production without a breakdown by end use.

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TABLE 4

MINNESOTA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2005, BY USE AND DISTRICT[1, 2]

(Thousand metric tons and thousand dollars)

Use	District 2		District 3		District 4	
	Quantity	Value	Quantity	Value	Quantity	Value
Construction:						
Coarse aggregate (+1½ inch)[3]	--	--	W	W	--	--
Coarse aggregate, graded[4]	--	--	W	W	--	--
Fine aggregate (-⅜ inch)[5]	--	--	W	W	--	--
Coarse and fine aggregates[6]	--	--	W	W	--	--
Agricultural[7]	--	--	--	--	--	--
Unspecified:[8]						
Reported	--	--	--	--	1,010	7,780
Estimated	5	42	359	3,000	865	7,400
Total	5	42	2,010	17,200	1,880	15,100

	District 5		District 6	
	Quantity	Value	Quantity	Value
Construction:				
Coarse aggregate (+1½ inch)[3]	W	W	W	W
Coarse aggregate, graded[4]	W	W	W	W
Fine aggregate (-⅜ inch)[5]	W	W	W	W
Coarse and fine aggregates[6]	W	W	W	W
Agricultural[7]	W	W	W	W
Unspecified:[8]				
Reported	1,160	9,950	113	970
Estimated	2,600	23,000	1,400	13,000
Total	4,810	41,200	1,760	13,400

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]No crushed stone produced in District 1.

[3]Includes filter stone, macadam, and riprap and jetty stone.

[4]Includes bituminous aggregate (coarse), bituminous surface-treatment aggregate, concrete aggregate (coarse), and railroad ballast.

[5]Includes screening (undesignated), stone sand bituminous mix or seal, and other fine aggregate.

[6]Includes crusher run or fill or waste, graded road base or subbase, unpaved road surfacing, and other coarse and fine aggregates.

TABLE 5

MINNESOTA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2005, BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	4,510	$23,400	$5.20
Plaster and gunite sands	99	684	6.94
Concrete products (blocks, bricks, pipe, decorative, etc.)	169	1,900	11.26
Asphaltic concrete aggregates and other bituminous mixtures	5,230	24,700	4.72
Road base and coverings	8,970	28,200	3.14
Road and other stabilization (cement and lime)	96	670	6.95
Fill	3,210	9,830	3.06
Snow and ice control	169	847	5.03
Roofing granules	26	208	8.16
Other miscellaneous uses[2]	85	609	7.21
Unspecified:[3]			
Reported	21,400	116,000	5.40
Estimated	10,100	46,400	4.57
Total or average	54,100	253,000	4.68

[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

[2]Includes filtration and railroad ballast.

[3]Reported and estimated production without a breakdown by end use.

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TABLE 6

MINNESOTA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2005, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate (including concrete sand)	1,360	8,380	935	4,310	516	2,430
Concrete products (blocks, bricks, pipe, decorative, etc.)[2]	W	W	W	W	73	463
Asphaltic concrete aggregates and other bituminous mixtures	W	W	206	759	1,310	4,640
Road base and coverings[3]	2,100	6,830	977	3,120	2,560	8,230
Fill	486	1,060	194	574	506	1,430
Snow and ice control	W	W	W	W	37	430
Other miscellaneous uses[4]	1,270	6,390	58	280	80	489
Unspecified:[5]						
Reported	(6)	4	475	2,200	10,700	53,600
Estimated	1,780	8,120	2,770	12,700	1,890	8,600
Total	6,990	30,800	5,610	23,900	17,700	80,300

	District 4		District 5		District 6	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate (including concrete sand)	725	3,800	405	1,770	289	2,130
Concrete products (blocks, bricks, pipe, decorative, etc.)[2]	17	74	W	W	W	W
Asphaltic concrete aggregates and other bituminous mixtures	770	5,560	570	3,550	W	W
Road base and coverings[3]	777	2,500	590	2,990	236	1,000
Fill	621	1,920	1,190	3,900	218	953
Snow and ice control	10	50	W	W	W	W
Other miscellaneous uses[4]	16	179	139	1,860	241	1,430
Unspecified:[5]						
Reported	295	1340	5,350	37,100	1,320	7,180
Estimated	686	3,090	1,370	6,250	1,660	7,650
Total	3,920	18,500	9,600	57,500	3,960	20,300

	Unspecified districts	
	Quantity	Value
Concrete aggregate (including concrete sand)	278	614
Concrete products (blocks, bricks, pipe, decorative, etc.)[2]	--	--
Asphaltic concrete aggregates and other bituminous mixtures	943	2,720
Road base and coverin gs[3]	1,820	4,190
Fill	--	--
Snow and ice control	27	45
Other miscellaneous uses[4]	--	--
Unspecified:[5]		
Reported	3,270	14,200
Estimated	--	--
Total	6,340	21,800

W Withheld to avoid disclosing company proprietary data; included in "Other miscellaneous uses." -- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes plaster and gunite sands.

[3]Includes road and other stabilization (cement and lime).

[4]Includes filtration, railroad ballast, and roofing granules.

[5]Reported and estimated production without a breakdown by end use.

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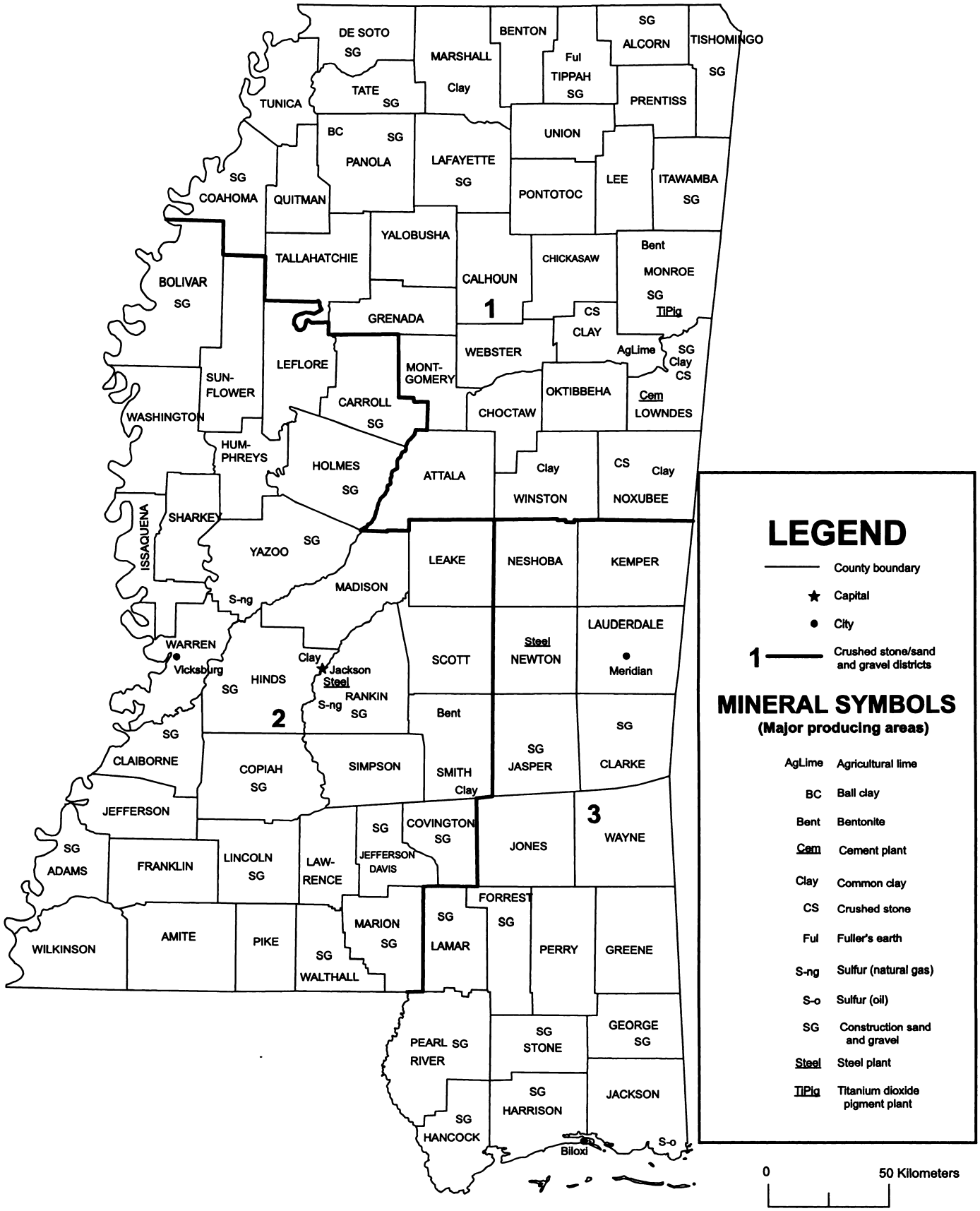
MISSISSIPPI



LEGEND

- County boundary
- ★ Capital
- ● City
- 1 — Crushed stone/sand and gravel districts

MINERAL SYMBOLS

(Major producing areas)

AgLime	Agricultural lime
BC	Ball clay
Bent	Bentonite
Cem	Cement plant
Clay	Common clay
CS	Crushed stone
Ful	Fuller's earth
S-ng	Sulfur (natural gas)
S-o	Sulfur (oil)
SG	Construction sand and gravel
Steel	Steel plant
TiPig	Titanium dioxide pigment plant

Source: Mississippi Department of Environmental Quality, Office of Geology/U.S. Geological Survey (2005)

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THE MINERAL INDUSTRY OF MISSISSIPPI

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Mississippi Department of Environmental Quality, Office of Geology for collecting information on all nonfuel minerals.

In 2005, Mississippi's nonfuel raw mineral production was valued[1] at $215 million, based upon annual U.S. Geological Survey (USGS) data. This was up 10.8% from the State's total nonfuel mineral value for 2004 of $194 million, which followed a marginal increase from 2003.

Construction sand and gravel was Mississippi's leading nonfuel mineral, accounting for nearly 40% of the State's total nonfuel mineral production value in 2005. When combined with the value of crushed stone, the State's two major mined construction materials accounted for 59% of Mississippi's total value. In 2005, in descending order of value, construction sand and gravel was followed by crushed stone, portland cement, fuller's earth, bentonite, and ball clay, in contrast to 2004 when fuller's earth was the State's second-leading nonfuel mineral by value. The production and value of fuller's earth decreased a relatively small amount; the major changes were significant increases in the production and value of crushed stone and in the value of portland cement (slight production increase). In 2005, increases in the values of portland cement, up more than $10 million, crushed stone, up $7.5 million, and construction sand and gravel, up $4.5 million, led the State's rise in value for the year. These increases were partly offset by decreases in fuller's earth, down $2.2 million, and bentonite, down about $1 million (table 1).

In 2005, Mississippi continued to be second in the quantities of bentonite produced and third in ball clay and fuller's earth as compared with other producing States. Additionally, the State continued to be a significant producer of construction sand and gravel and common clays. Metals that were produced in Mississippi, especially raw steel, were processed from materials received from other domestic and foreign sources.

The following narrative information was provided by the Mississippi Department of Environmental Quality's (DEQ) Office of Geology[2] (MOG). The Mississippi DEQ issued 65 surface mining permits for industrial mineral operations covering approximately 615 hectares (ha) (1,520 acres) and processed 110 Notices of Exempt Operations [1.6 ha (4 acres) or less] covering approximately 178 ha. Under State law, surface mines of 1.6 ha or less were required neither to obtain a mining permit nor to perform reclamation of any kind. The Mining and Reclamation Division performed 816 annual inspections for all active mining permits on file and received applications for bond release on 92 permits. During the year, a total of 408 ha was reclaimed and released.

All mines in Mississippi were surface industrial mineral operations except one, the State's only coal (lignite) mine. Mississippi Lignite Mining Company in Choctaw County, continued to mine and stockpile lignite, producing approximately 3.1 million metric tons per year (3.4 million short tons) of lignite from the Wilcox Group formation. The brownish black coal material is mined for feed to the 440-megawatt Red Hills "mine-mouth" powerplant that uses state-of-the-art technology to produce electricity that is sold to the Tennessee Valley Authority. In 2005, a proposal by the company to use coal ash on roads and ramps in the mine was approved by the Mississippi Department of Environmental Quality, Office of Pollution Control.

Commodity Review

Industrial Minerals

Mining activity in the State, mainly for sand and gravel, saw a large increase after Hurricane Katrina brought significant devastation to communities along the northcentral coast of the Gulf of Mexico. The demand for materials for use in building new houses, roads, and other structures rose substantially. Several mines on the coast also supplied sandy clay for use in rebuilding the levees in the city of New Orleans, LA. Many Mississippi mines that had previously stopped producing materials, but were not yet in the reclamation phase, became sites for landfills as the need for these became critical to the coastline communities. An unprecedented amount of debris had to be disposed of after the hurricane.

Bentonite.—The bentonite mines in northeast Mississippi declined in production in 2005 when one of the largest mines closed in Monroe County. Unimin Corp., the company that operated the mine, decided to move its interests out of the State. Unimin's mine was in the reclamation phase at yearend. Basf Catalysts LLC, which has a large bentonite mine in this area, also reduced personnel in Monroe County.

Government Programs

The Mining and Reclamation Division (MRD) continued to perform safety training for miners and certain other personnel at the State's mining and mineral processing operations in compliance with regulations (Part 46 and 48) of the U.S. Department of Labor's Mine Safety and Health Administration (MSHA). A grant from MSHA helped MRD provide the safety training. Of the MRD staff, three are certified by MSHA to do mine safety training, which was completed by approximately 580 people in 2005. Additionally, all operations that process

[1]The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2005 USGS mineral production data published in this chapter are those available as of December 2006. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—can be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

[2]Kenneth McCarley, Geologist and Director, Mining and Reclamation Division, Mississippi Office of Geology, authored the text of the State mineral industry information provided by that agency.

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material in some way, such as mining, rock crushing, or washing operations, were required to have detailed and all-encompassing safety plans in place at mines or mineral-processing sites, and all personnel were required to be trained in the execution of such plans.

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN MISSISSIPPI[1, 2]

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral	2003		2004		2005	
	Quantity	Value	Quantity	Value	Quantity	Value
Clays:						
Common	524	2,050	610	2,700	642	2,860
Fuller's earth	534	42,700	381	35,200	354	33,000
Gemstones	NA	1	NA	1	NA	1
Sand and gravel, construction	14,600	82,600	14,100	80,700	14,400	85,200
Stone, crushed	2,850	33,900	2,760	34,200	3,500	41,700
Combined values of cement (portland), clays (ball, bentonite), sand and gravel (industrial)	XX	31,400	XX	41,500	XX	52,000
Total	XX	193,000	XX	194,000	XX	215,000

NA Not available. XX Not applicable.
[1]Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2]Data are rounded to no more than three significant digits; may not add to totals shown.

TABLE 2
MISSISSIPPI: CRUSHED STONE SOLD OR USED, BY KIND[1]

Kind	2004			2005		
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Number of quarries	Quantity (thousand metric tons)	Value (thousands)
Limestone	3	2,760	$34,200	4	3,500	$41,700

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

TABLE 3
MISSISSIPPI: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2005, BY USE[1]

(Thousand metric tons and thousand dollars)

Use	Quantity	Value
Construction:		
Coarse aggregate (+1½ inch), other coarse aggregate	W	W
Coarse aggregate, graded, other graded coarse aggregate	W	W
Fine aggregate (-⅜ inch), other fine aggegate	W	W
Coarse and fine aggregates, other coarse and fine aggregates	W	W
Agricultural limestone	W	W
Chemical and metallurgical:		
Cement manufacture	W	W
Sulfur oxide removal	W	W
Unspecified:[2]		
Reported	937	6,710
Estimated	20	235
Total	957	6,950
Grand total	3,500	41,700

W Withheld to avoid disclosing company proprietary data; included in "Grand total."
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Reported and estimated production without a breakdown by end use.

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TABLE 4
MISSISSIPPI: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2005, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3		Unspecified districts	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Construction:								
Coarse aggregate (+1½ inch)[2]	W	W	W	W	W	W	2	18
Coarse aggregate, graded[3]	W	W	W	W	W	W	269	4,410
Fine aggregate (-⅜ inch)[4]	W	W	W	W	W	W	26	425
Coarse and fine aggregate[5]	W	W	W	W	W	W	4	12
Agricultural[6]	W	W	--	--	W	W	--	--
Chemical and metallurgical[7]	W	W	--	--	--	--	--	--
Unspecified:[8]								
Reported	468	3,360	468	3,360	--	--	--	--
Estimated	20	235	--	--	--	--	--	--
Total	1,890	18,600	480	3,560	834	14,700	301	4,870

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes other coarse aggregate.
[3]Includes other graded coarse aggregate.
[4]Includes other fine aggregate.
[5]Includes other coarse and fine aggregates.
[6]Includes agricultural limestone.
[7]Includes cement manufacture and sulfur oxide removal.
[8]Reported and estimated production without a breakdown by end use.

TABLE 5
MISSISSIPPI: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2005,
BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	5,240	$31,300	$5.97
Concrete products (blocks, bricks, pipe, decorative, etc.)[2]	103	724	7.02
Asphaltic concrete aggregates and other bituminous mixtures	2,310	15,600	6.76
Road base and coverings[3]	881	4,190	4.76
Fill	300	465	1.55
Other miscellaneous uses	2	63	27.56
Unspecified:[4]			
Reported	2,320	13,800	5.97
Estimated	3,220	19,000	5.90
Total or average	14,400	85,200	5.93

[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.
[2]Includes plaster and gunite sands.
[3]Includes road and other stabilization (lime).
[4]Reported and estimated production without a breakdown by end use.

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TABLE 6

MISSISSIPPI: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2005, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products[2]	2,380	13,500	2,180	14,400	625	3,100
Asphaltic concrete aggregates and road base materials[3]	1,440	8,030	1,380	9,390	154	1,020
Fill	110	189	13	21	157	203
Other miscellaneous uses	--	--	--	--	2	63
Unspecified:[4]						
Reported	1,520	9,100	603	3,600	195	1,130
Estimated	838	4,940	1,500	8,820	881	5,200
Total	6,290	35,800	5,670	36,300	2,010	10,700

Use	Unspecified districts	
	Quantity	Value
Concrete aggregate and concrete products[2]	162	968
Asphaltic concrete aggregates and road base materials[3]	221	1,370
Fill	21	51
Other miscellaneous uses	--	--
Unspecified:[4]		
Reported	--	--
Estimated	--	--
Total	404	2,390

-- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes plaster and gunite sands.

[3]Includes road and other stabilization (lime).

[4]Reported and estimated production without a breakdown by end use.

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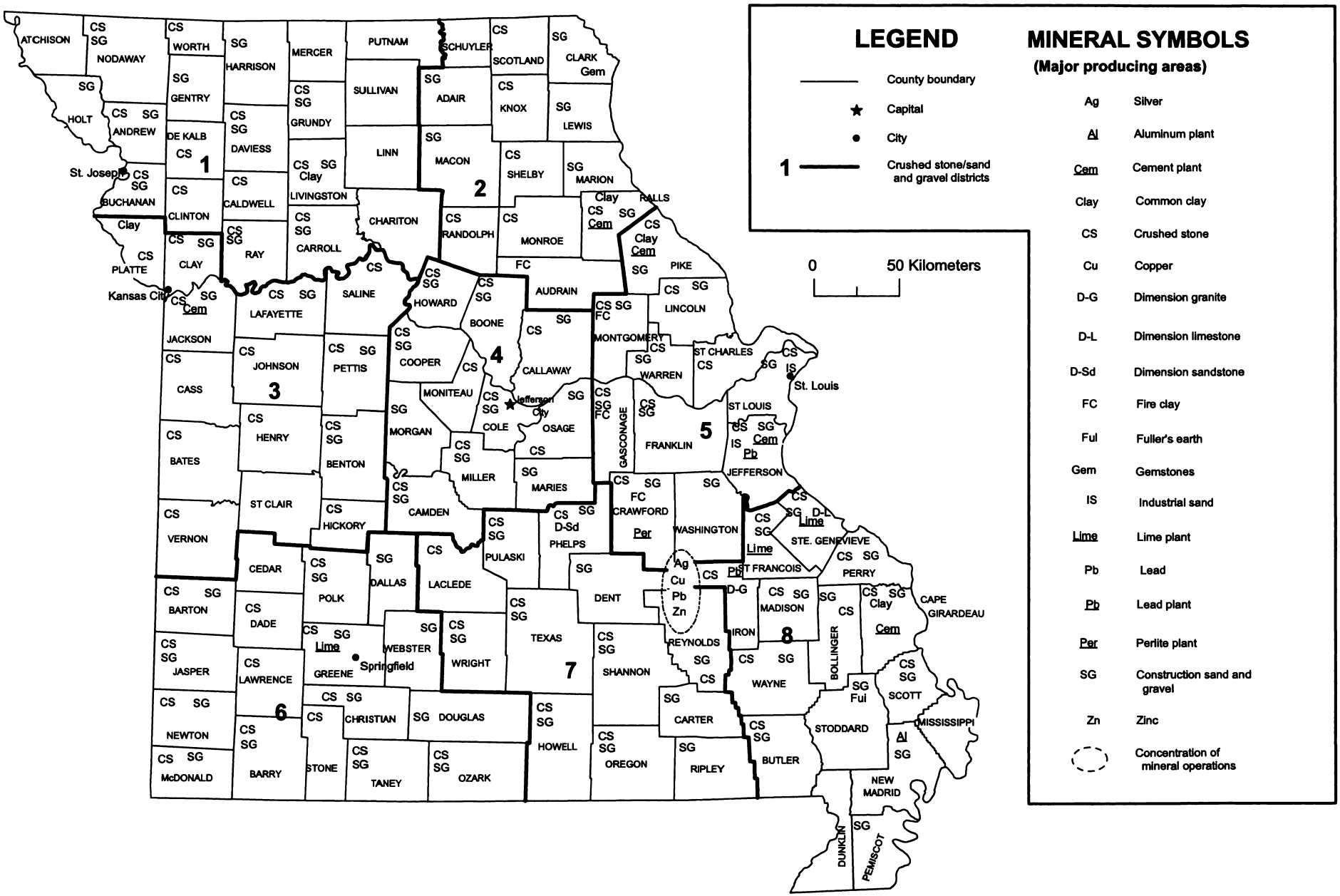

Source: Missouri Department of Natural Resources, Division of Geology and Land Survey/U.S. Geological Survey (2005)

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The Mineral Industry of Missouri

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Missouri Department of Natural Resources, Division of Geology and Land Survey, for collecting information on all nonfuel minerals.

In 2005, Missouri's nonfuel raw mineral production was valued[1] at $1.94 billion, based upon annual U.S. Geological Survey (USGS) data. This was a 19.8% increase from the State's total nonfuel mineral value of $1.62 billion[2] for 2004, which followed a 20.9% increase from 2003 to 2004. The State rose to 8th from 10th in rank among the 50 States in total nonfuel mineral production value, of which Missouri accounted for 3.5% of the U.S. total.

Crushed stone, cement (portland and masonry), lead, and lime, in descending order of value, accounted for nearly 90% of Missouri's total nonfuel mineral production value in 2005. Even though Missouri did continue to be the top lead-producing State in the Nation, producing significantly more than one-half of the Nation's output, by value, crushed stone and cement, by a significant margin, remained the State's leading nonfuel minerals in 2005, having surpassed lead in 1997 and 1999, respectively. Prior to 1997, lead had been Missouri's leading nonfuel mineral since 1969, except for several years in the mid-1980s and during 1993-95, when crushed stone was ranked first.

In 2005, in descending order of change, increases in the values of crushed stone, portland cement, lead, and lime led Missouri's increase in total nonfuel mineral production value for the year, with increases of nearly $170 million, $76 million, more than $40 million, and nearly $15 million, respectively. The unit values of each also increased significantly. With a 7% increase in production, the value of crushed stone rose nearly 30%, and a marginal increase in portland cement production resulted in a nearly 20% increase in the commodity's total value. Similarly, those of lead and lime also rose. Smaller yet significant increases took place also in the values of the mineral commodities of zinc, silver, copper, construction sand and gravel, and fire clay with increases in the unit values of each (table 1).

In 2005, Missouri continued to be first in the quantities of lead and lime produced, first of four fire clay-producing States, second in fuller's earth, and sixth in the production of silver. The State was third in the production of cadmium (a byproduct of zinc production), but decreased to third from second in that of zinc and to sixth from fifth in portland cement. Missouri remained 10th in the production of masonry cement, and continued to be a significant producer of construction sand and gravel, industrial sand and gravel, common clays, and gemstones (gemstones based upon value).

The Missouri Department of Natural Resources, Division of Geology and Land Survey[3] (DGLS), provided the following narrative information. Some data or information as reported by the DGLS may differ from USGS estimates and production figures.

Commodity Review

Industrial Minerals

Cement.—In Missouri, cement was produced at five separate cement plants in 2005, one of which was undergoing an upgrade to increase its capacity; also, work had begun toward the building of a sixth plant. From north to south along the Mississippi River; Continental Cement Co. LLC operated the Hannibal plant in Ralls County; Holcim (US) Inc. operated the Clarksville plant in Pike County; and Buzzi Unicem USA operated a plant at Selma in Jefferson County and a plant at Cape Girardeau in Cape Girardeau County. In western Missouri, Lafarge North America operated the Sugar Creek plant in Jackson County.

The capacity of cement production in Missouri was projected to increase in the next several years, in part because Buzzi Unicem USA began a project to upgrade its Selma, MO, plant to increase the cement capacity from 1.3 million metric tons (Mt) to 2.3 Mt. Also, Holcim had begun work on its new cement plant in northeastern Ste. Genevieve County along the Mississippi River. The plant was due to come on line in 2009 with an annual capacity of 4 Mt of cement.

Clays.—Total clay mine production in Missouri increased by as much as 7% from 2004 to 2005 according to the State's mine inspector, mainly owing to increased demand for common clay by the cement industry (table 1 shows "sales or used" rather than production—fire clay and fuller's earth withheld). The three types of clay produced were common clay, fire clay, and fuller's earth. The majority of the common clay mined was used in the production of portland cement. Production of common clay was expected to increase significantly with the opening and expansion of the cement plants previously mentioned. Production of fire clay had decreased for the year. Though the number of mines operating in the Northern and Southern

[1]The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2005 USGS mineral production data published in this chapter are those available as of December 2006. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—can be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

[2]This figure is a revision to the previously published $1.34 billion in the The Mineral Industry of Missouri chapter in the U.S. Geological Survey Minerals Yearbook, Area Reports: Domestic 2004 Volume II; the value of crushed stone was revised to $564 million from $426 million resulting from a revision in the quantity produced to 92.6 million metric tons (Mt) from 69.1 Mt (table 1).

[3]Edith Starbuck, a Missouri Registered Geologist and a Geologist II with the Missouri Department of Natural Resources, Division of Geology and Land Survey, Geologic Resources Section, authored the text of Missouri mineral industry information.

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Fire Clay Districts decreased during the past several years, production from several individual mines appeared to have increased from 2004 to 2005. Fuller's earth was mined by Nestle Purina Petcare Co. from Paleocene-age Porter's Creek Clay in Stoddard County and was used to make absorbent pet litter.

Construction Sand and Gravel.—New State rules on sand and gravel extraction from streams became effective in October 2004. Production of construction sand and gravel appeared unaffected by implementation of the new rules because tonnage increased by about 12% more than 2004, according to the State's mine inspector. The Land Reclamation Program permitted 390 sand and gravel operations in 61 Missouri counties during 2005.

Crushed Stone.—For Missouri, 2005 was a fairly active year for the crushed stone industry with an increase in production of about 6.8% (production data reported to the USGS indicated about a 7.3% increase—table 1). High demand was stimulated by increased road construction as well as a robust economy, which resulted in increases in both residential and commercial construction. The Land Reclamation Program had 379 crushed limestone or dolomite quarries in 96 Missouri counties under permit during 2005. Four granite or traprock quarries were permitted in Iron and Wayne Counties.

Dimension Stone.—Missouri Red Quarries, Inc. produced dimension granite from the Graniteville Quarry in Iron County. According to the State's mine inspector, production decreased significantly during the last half of calendar year 2005.

Gemstones.—Quartz geodes from the Mississippian-age Warsaw Formation in extreme northeastern Missouri constituted the only substantial gemstone production in Missouri during 2005.

Industrial (Silica) Sand.—Silica sand was mined from the Ordovician-age St. Peter Sandstone in St. Louis and Jefferson Counties by Buzzi Unicem, USA, Unimin Corp., and U.S. Silica Company.

Lime.—Quicklime and hydrated lime were manufactured in Greene and Ste. Genevieve Counties by Mississippi Lime Co., and quicklime was produced by Chemical Lime Co. in Ste. Genevieve County. Vessell Mineral Products Co., in St. Francois County, produced dolomitic lime for the steel industry. Work was in progress to close down Mississippi Lime's Springfield plant in Greene County. The kiln was shut down in December 2005 and the plant ran off inventory on into 2006. Thirty-four employees faced layoff and one person was to be transferred to the Ste. Genevieve operation. To replace capacity lost by the closure of the Springfield plant, Mississippi Lime commissioned a new vertical shaft kiln at its Ste. Genevieve plant in August. Another kiln of similar design was scheduled for installation in 2006.

Metals

Copper, Lead, Silver, and Zinc.—All production of metals in Missouri came from Doe Run Co.'s underground mines in the Viburnum Trend on the west side of the St. Francois Mountains in the southeastern portion of the State. Ore minerals were galena, sphalerite, chalcopyrite, and bornite, in order of decreasing abundance, with small amounts of silver associated with the galena. The company's Viburnum, Buick, Brushy Creek, Fletcher, and Sweetwater Mines were operating in 2005.

Legislation and Government Programs

New rules affecting sand and gravel extraction from streams became effective in October 2004, as cited at Missouri Code of State Regulations, Rules of Department of Natural Resources, Division 40 - Land Reclamation Commission, Chapter 10 – Permit and Performance Requirements for Industrial Mineral Open Pit and In-Stream Sand and Gravel Operations (10 CSR 40-10.020 and 050) (Missouri Department of Natural Resources, 2005§[4]). The rules, enforced by the Missouri Department of Natural Resources Land Reclamation Program, basically required operators to stay out of the flowing water of a stream and to leave protective bank vegetation intact. The rules were implemented to provide a fair and consistent set of standards for stream protection targets and are requirements under the permitting of mining operations. Private landowners that mine these products for personal use are exempt from the law, as are the military and any political subdivision.

The reorganization in State government that took place in 2005 affected the Missouri Department of Natural Resources in 2005. The Department's Geological Survey and Resource Assessment Division was renamed the Division of Geology and Land Survey (DGLS). The staff of the Water Resources Section was reassigned to the Water Resources Center, a part of the Department's Office of the Director, and the Wellhead Protection Section was reassigned to the Division of Environmental Quality. The staff whose primary job description was information technology was reassigned to the Information Technology Services Division in the Missouri State government's Office of Administration.

The DGLS continued bedrock and surficial materials geologic mapping in the Fulton 30′ × 60′ quadrangle, northeast of Jefferson City, at the 1:24,000 scale and a compilation of the bedrock geologic mapping done for the Festus 30′ × 60′ quadrangle, south of St. Louis, was produced at the 1:100,000 scale. Near the end of 2005, the DGLS published the Paleozoic Succession in Missouri, Part 5 – Pennsylvanian Subsystem, the definitive work on the stratigraphy of the Pennsylvanian Subsystem in Missouri.

DGLS staff also completed a collection of samples for the Missouri portion of the National Geochemical Survey. "The USGS, in collaboration with other Federal and State government agencies, industry, and academia, is conducting the National Geochemical Survey (NGS) to produce a body of geochemical data for the United States based primarily on stream sediments, analyzed using a consistent set of methods. These data will compose a complete, national-scale geochemical coverage of the United States, and will enable construction of geochemical maps, refine estimates of baseline concentrations of chemical elements in the sampled media, and provide context for a wide variety of studies in the geological and environmental sciences" (U.S. Geological Survey, 2007§). The DGLS staff's goal of the 2-year project was to collect 500 samples of stream sediment

[4]References that include a section mark (§) are found in the Internet References Cited section.

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or soil or that of both. The staff collected a total of 575 samples based upon a predetermined sampling grid that covered nearly 13 million hectares (about 50,000 square miles), including all of the State north of the 38th parallel and about three-eighths of the State south of the 38th parallel. The work was done under a cooperative agreement with the USGS.

The DGLS began development of its Missouri Geologic Map Index on the Internet in late 2004 and continued development of the Internet site throughout 2005 (Missouri Division of Geology and Land Survey, 2007§).

Internet References Cited

Missouri Department of Natural Resources, 2005, Rules of Department of Natural Resources, Division 40—Land Reclamation Commission, Chapter 10—Permit and performance requirements for industrial mineral open pit and in-stream sand and gravel operations, accessed December 6, 2007, at URL http://www.sos.mo.gov/adrules/csr/current/10csr/10c40-10.pdf.

Missouri Division of Geology and Land Survey, 2007 (August 8), Missouri geologic map index, accessed December 6, 2007, at URL http://www.dnr.mo.gov/geology/statemap/missouri-maps.htm.

U.S. Geological Survey, 2007, The national geochemical survey—Database and documentation, accessed December 6, 2007, at URL http://tin.er.usgs.gov/geochem/doc/home.htm.

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN MISSOURI[1,2]

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral	2003		2004		2005	
	Quantity	Value	Quantity	Value	Quantity	Value
Cement, portland	5,180	352,000 e	5,260	388,000 e	5,330	464,000 e
Clays:						
Common	970	3,660	911	3,290	822	3,400
Fire	307	7,230	W	W	W	W
Sand and gravel:						
Construction	10,600	49,400	12,200	60,000	12,200	61,600
Industrial	586	12,800	589	14,200	559	14,500
Stone, crushed	71,500	426,000	92,600 r	564,000 r	99,400	733,000
Combined values of cadmium (byproduct of zinc concentrates [2004-05]), cement (masonry), clays (fuller's earth), copper, gemstones (natural), lead, lime, silver, stone (dimension granite), zinc, and values indicated by symbol W	XX	488,000	XX	593,000 r	XX	666,000
Total	XX	1,340,000	XX	1,620,000 r	XX	1,940,000

eEstimated. rRevised. W Withheld to avoid disclosing company proprietary data. Withheld values included in "Combined values" data. XX Not applicable.

[1]Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

[2]Data are rounded to no more than three significant digits; may not add to totals shown.

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TABLE 2
MISSOURI: CRUSHED STONE SOLD OR USED, BY KIND[1]

Kind	2004 Number of quarries	2004 Quantity (thousand metric tons)	2004 Value (thousands)	2005 Number of quarries	2005 Quantity (thousand metric tons)	2005 Value (thousands)
Limestone[2]	167 r	87,800 r	$484,000 r	155	93,300	$631,000
Dolomite	18	3,060	16,800	18	3,860	26,400
Granite	2	W	W	2	W	W
Traprock	2	W	W	1	W	W
Sandstone	1	W	W	--	--	--
Total	XX	92,600 r	564,000 r	XX	99,400	733,000

rRevised. W Withheld to avoid disclosing company proprietary data; included in "Total." XX Not applicable. -- Zero.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes limestone-dolomite reported with no distinction between the two.

TABLE 3
MISSOURI: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2005, BY USE[1]

(Thousand metric tons and thousand dollars)

Use	Quantity	Value
Construction:		
Coarse aggregate (+1½ inch):		
Macadam	310	2,180
Riprap and jetty stone	1,670	6,200
Filter stone	368	2,650
Other coarse aggregates	1,360	8,870
Total	3,710	19,900
Coarse aggregate, graded:		
Concrete aggregate, coarse	2,690	19,600
Bituminous aggregate, coarse	1,210	9,040
Bituminous surface-treatment aggregate	101	895
Railroad ballast	1,330	6,560
Other graded coarse aggregates	5,860	39,700
Total	11,200	75,800
Fine aggregate (-⅜ inch):		
Stone sand, concrete	320	2,590
Stone sand, bituminous mix or seal	95	566
Screening, undesignated	516	1,380
Other fine aggregates	1,680	13,700
Total	2,620	18,300
Coarse and fine aggregates:		
Graded road base or subbase	4,920	22,600
Unpaved road surfacing	553	3,410
Terrazzo and exposed aggregate	W	W
Crusher run or fill or waste	455	2,500
Roofing granules	W	W
Other coarse and fine aggregates	9,340	59,100
Total	15,900	155,000
Other construction materials	591	4,190
Agricultural, limestone	(2)	(2)
Chemical and metallurgical:		
Cement manufacture	(2)	(2)
Lime manufacture	(2)	(2)
Special, asphalt fillers or extenders	(2)	(2)
Unspecified:[3]		
Reported	18,100	132,000
Estimated	40,000	298,000
Total	58,500	431,000
Grand total	99,400	733,000

W Withheld to avoid disclosing company proprietary data; included in "Total."
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Withheld to avoid disclosing company proprietary data; included in "Grand total."
[3]Reported and estimated production without a breakdown by end use.

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TABLE 4

MISSOURI: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2005, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3		District 4	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Construction:								
Coarse aggregate (+1½ inch)[2]	W	W	W	W	31	188	W	W
Coarse aggregate, graded[3]	W	W	W	W	W	W	W	W
Fine aggregate (-⅜ inch)[4]	W	W	W	W	W	W	--	--
Coarse and fine aggregates[5]	W	W	W	W	W	W	W	W
Other construction materials	--	--	--	--	--	--	--	--
Agricultural[6]	30	153	W	W	9	50	W	W
Chemical and metallurgical[7]	W	W	W	W	8	31	2	8
Special[8]	--	--	--	--	--	--	--	--
Unspecified:[9]								
Reported	2,720	19,600	1,870	13,700	5,550	40,700	266	1,970
Estimated	663	4,900	1,200	9,100	2,400	17,000	2,400	18,000
Total	4,490	34,300	4,790	31,000	10,800	78,800	5,080	33,800

	District 5		District 6		District 7		District 8	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Construction:								
Coarse aggregate (+1½ inch)[2]	1,280	8,430	W	W	W	W	W	W
Coarse aggregate, graded[3]	W	W	1,920	15,700	W	W	2,110	10,500
Fine aggregate (-⅜ inch)[4]	W	W	W	W	W	W	62	372
Coarse and fine aggregates[5]	5,720	35,600	1,830	10,500	W	W	3,800	80,100
Other construction materials	521	3,720	48	336	22	129	--	--
Agricultural[6]	W	W	239	1,600	W	W	W	W
Chemical and metallurgical[7]	W	W	W	W	--	--	W	W
Special[8]	--	--	--	--	--	--	W	W
Unspecified:[9]								
Reported	2,810	20,500	2,280	16,900	--	--	2,580	19,000
Estimated	3,600	27,000	4,300	31,000	1,200	8,600	25,000	183,000
Total	22,100	146,000	11,600	82,400	2,100	13,500	38,400	313,000

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes filter stone, macadam, riprap and jetty stone, and other coarse aggregate.

[3]Includes concrete aggregate (coarse), bituminous aggregate (coarse), bituminous surface-treatment aggregate, railroad ballast, and other graded coarse aggregate.

[4]Includes screening (undesignated), stone sand bituminous mix or seal, stone sand (concrete), and other fine aggregate.

[5]Includes crusher run or fill or waste, graded road base or subbase, roofing granules, terrazzo and exposed aggregate, unpaved road surfacing, and other coarse and fine aggregates.

[6]Includes agricultural limestone.

[7]Includes cement and lime manufacture.

[8]Includes asphalt fillers or extenders.

[9]Reported and estimated production without a breakdown by end use.

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TABLE 5
MISSOURI: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2005,
BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	6,950	$33,600	$4.84
Concrete products (blocks, bricks, pipe, decorative, etc.)[2]	351	2,510	7.14
Asphaltic concrete aggregates and other bituminous mixtures	397	2,750	6.94
Road base and coverings[3]	223	900	4.04
Fill	366	1,910	5.22
Snow and ice control	24	124	5.08
Other miscellaneous uses[4]	266	1,920	7.23
Unspecified:[5]			
Reported	1,140	5,520	4.85
Estimated	2,460	12,300	5.02
Total or average	12,200	61,600	5.06

[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes plaster and gunite sands.
[3]Includes road and other stabilization (lime).
[4]Includes roofing granules.
[5]Reported and estimated production without a breakdown by end use.

TABLE 6
MISSOURI: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2005, BY USE AND DISTRICT[1, 2]

(Thousand metric tons and thousand dollars)

	Districts 1 and 2		District 3		Districts 4 and 5	
Use	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products[3]	384	2,160	--	--	5,650	29,200
Asphaltic concrete aggregates and road base materials[4]	W	W	--	--	321	2,050
Fill	21	70	--	--	321	1,750
Snow and ice control	W	W	--	--	W	W
Other miscellaneous uses[5]	11	60	--	--	247	1,800
Unspecified:[6]						
Reported	118	657	(7)	2	756	4,030
Estimated	462	2,320	410	2,060	1,310	6,540
Total	996	5,260	410	2,060	8,600	45,400

	Districts 6 and 7		District 8		Unspecified districts	
Use	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products[3]	143	849	275	1,430	848	2,500
Asphaltic concrete aggregates and road base materials[4]	52	298	W	W	--	--
Fill	24	88	--	--	--	--
Snow and ice control	12	70	--	--	--	--
Other miscellaneous uses[5]	28	154	239	1,260	--	--
Unspecified:[6]						
Reported	20	116	--	--	243	717
Estimated	255	1,280	28	141	--	--
Total	535	2,860	542	2,830	1,090	3,220

W Withheld to avoid disclosing company proprietary data; included in "Other miscellaneous uses." -- Zero.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Districts 1 and 2, 4 and 5, and 6 and 7 are combined to avoid disclosing company proprietary data.
[3]Includes plaster and gunite sands.
[4]Includes road and other stabilization (lime).
[5]Includes roofing granules.
[6]Reported and estimated production without a breakdown by end use.
[7]Less than ½ unit.

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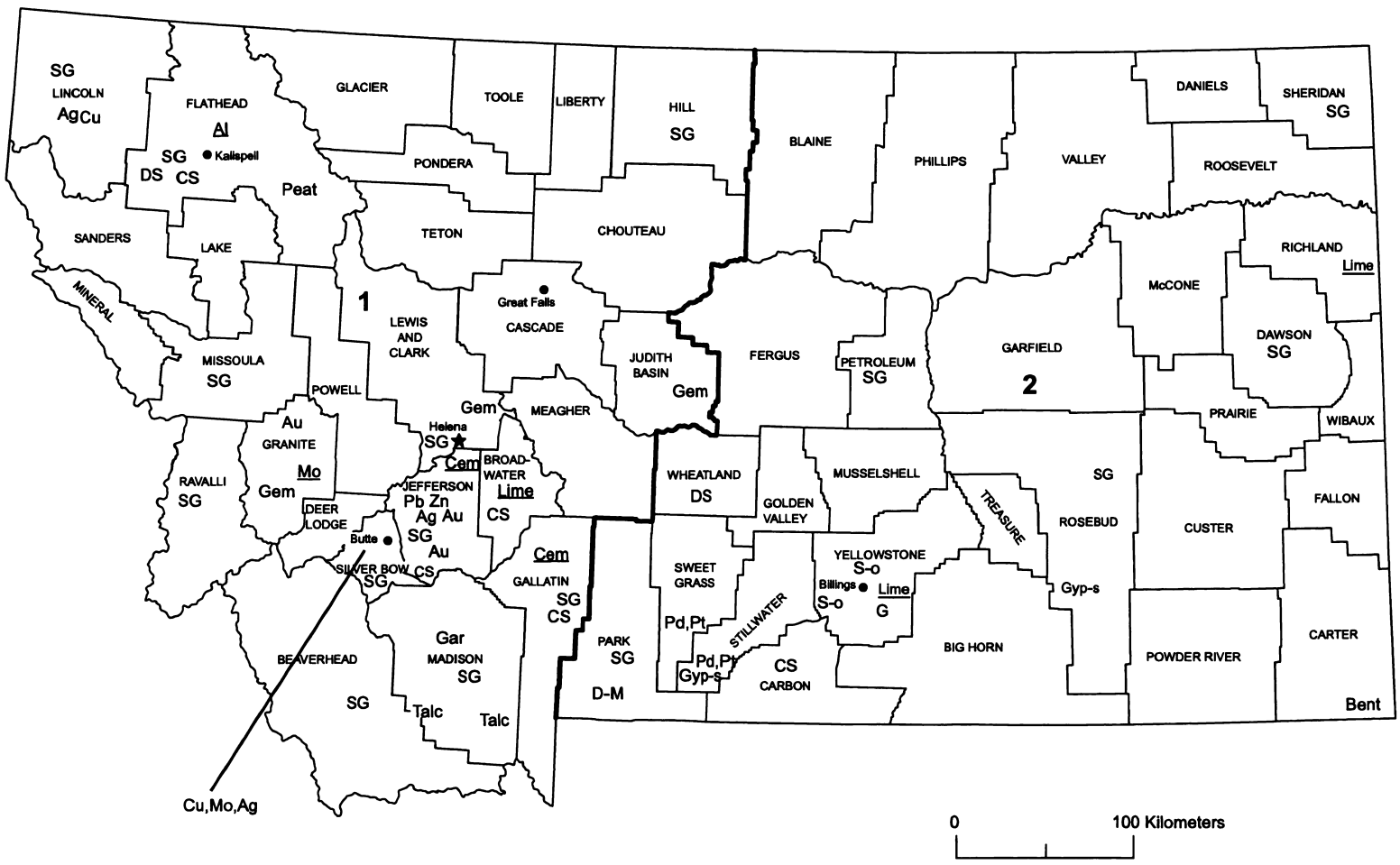
MONTANA



LEGEND

- County boundary
- Capital
- City
- 1 Crushed stone/sand and gravel districts

MINERAL SYMBOLS
(Major producing areas)

Ag	Silver
Al	Aluminum plant
Au	Gold
Bent	Bentonite
Cem	Cement plant
CS	Crushed stone
Cu	Copper
D-M	Dimension marble
DS	Dimension stone
Gar	Garnet
Gem	Gemstones
Gyp-s	Synthetic gypsum
Lime	Lime plant
Mo	Molybdenum
Mo	Molybdenum plant
Pb	Lead
Pd	Palladium
Peat	Peat
Pt	Platinum
S-o	Sulfur (oil)
SG	Construction sand and gravel
Talc	Talc
Zn	Zinc

Source: Montana Bureau of Mines and Geology/U.S. Geological Survey (2005)

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THE MINERAL INDUSTRY OF MONTANA

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Montana Bureau of Mines and Geology for collecting information on all nonfuel minerals.

In 2005, Montana's nonfuel raw mineral production was valued[1] at $847 million, based upon annual U.S. Geological Survey (USGS) data. This was an increase of $226 million, or more than 36%, from the value of 2004, which in turn was up $127 million, or up nearly 26%, from that of 2003. The State rose in rank to 24th from 26th among the 50 States in nonfuel raw mineral production value and accounted for more than 1.5% of the U.S. total. Yet, per capita, the State ranked 5th in the Nation in the value of its nonfuel mineral production; with a population of about 936,000, the value of production was $906 per capita.

Metallic minerals accounted for nearly 77% of Montana's total nonfuel mineral production value in 2005. Molybdenum concentrates, copper, platinum, and palladium were, in descending order of value, the State's leading nonfuel minerals, followed by construction sand and gravel, portland cement, and gold, the combined total of which accounted for nearly 98% of the State's total nonfuel mineral value. In 2005, 17 of Montana's 21 nonfuel mineral commodities increased in value, the largest increases being those of molybdenum concentrates, copper, and gold, which were up by more than $120 million, about $50 million, and more than $40 million, respectively (table 1). The average unit values for each of the three showed significant increases, especially those of molybdenum concentrates and copper. Production for all three also significantly increased, the largest increase being in the production of gold, which was up by substantially more than 200%.

The prices for copper and for molybdenum concentrates have risen markedly during the past 2 years. The single highest increase in value in molybdenum concentrates resulted from the dramatic increase in the commodity's prices during 2004-05, which continued an upward trend that began in December 2002 that continued on throughout 2003 and 2004. As reported in Platts Metals Week, the time-weighted average price of molybdic oxide rose from $8.27 per kilogram (kg) (reported as dollars per pound of contained molybdenum) in 2002, $11.75 per kg in 2003, $36.73 per kg in 2004, and nearly doubled to $70.10 per kg (about $32 per pound) in 2005. In June 2005, the molybdic oxide price reached its highest point of the 4-year run of $82.54, and then followed a generally downward trend during the remainder of the year to close at $61.84. Molybdenum concentrate prices had stayed relatively level during the early months of 2006.

Smaller yet significant increases also took place in the total values of portland cement and silver, and the unit values of each also increased significantly. The largest decrease in value took place in palladium. A 3% decrease in the production of palladium resulted in a drop of nearly $15 million, or more than 14%, in its value from that of 2004 (table 1).

In 2005, Montana continued to be the only State to have primary palladium and platinum mine production. It also continued to be first in the quantity of talc produced, third in bentonite, fourth in zinc, fifth in molybdenum concentrates and silver, and sixth in gemstones. The State was third of three industrial garnet-producing States, rose in rank to fifth from eighth in gold, decreased to fifth from fourth in copper, and remained a significant producer of construction sand and gravel.

The Montana Bureau of Mines and Geology[2] (MBMG) provided the narrative information that follows. Production and other data in the following text are those reported by the MBMG, based upon its own surveys and estimates. The data may differ from some production figures reported by the USGS.

Exploration and Development

Exploration activity in 2005 increased to 15 projects, more than doubling the 7 projects carried out in 2004. However, only 5 of the 2005 projects made it to a level of drill sampling and ore evaluation. Exploration for precious and base metals, including copper, was of primary interest. Other exploration activity included that for iron, garnets, and gemstones. Most of the exploration activity was accomplished by local residents seeking to establish a profitable business. A few Canadian companies also were involved in some exploration projects.

North of Butte, OT Mining Corporation, of Montreal, Quebec, Canada, staked an additional 383 claims, which increased the size of its Ruby property to about 54 square kilometers. The company completed an extensive geochemical and geophysical sampling program and drilled three holes into a copper–porphyry system. One hole showed nearly 430 meters (m) of subeconomic copper mineralization. The results of the geophysical tests indicated targets somewhat north of the existing drilling program. More geophysical work was scheduled for 2006.

Elkhorn Goldfields, Inc., (a subsidiary of Elkhorn Goldfields, LLC, an affiliate of Calim Private Equity, LLC, Aspen, CO) continued a long-term delineation drilling program on a series of copper–gold (magnetite–pyrrhotite) skarns east of Boulder. Drilling results identified 540,000 metric tons (t) of resource grading up to 0.5% copper and 9.6 grams per metric ton (g/t) (0.28 troy ounces per short ton) gold. The company was designing a decline that would facilitate further definition

[1]The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2005 USGS mineral production data published in this chapter are those available as of December 2006. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—can be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

[2]Robin B. McCulloch, Associate Research Mining Engineer, authored the text of the State mineral industry information provided by the Montana Bureau of Mines and Geology.

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drilling as well as bulk testing of the skarns. In earlier vertical drilling, Elkhorn had identified several deposits, and also had noted a few small satellite ore bodies that were previously unknown.

West of Silver Star, Coronado Resources, Ltd., Vancouver, British Columbia, Canada, drilled five holes at the Broadway-Victoria Mine (Madison Gold project). Results in the first four holes ranged from about 1% to nearly 4% copper in 1- to 8-m intercepts. The fifth hole intersected 20 m of resource grading 19.24% copper, including 8 m of resource grading 41.05% copper. Concentrations in this hole ranged from 9.8 to 19.6 g/t gold over 1.5- to 4.5-m intervals. The deposit is a skarn-hosted system that appears to have potential for a copper supergene zone.

Golden Arrow Mining Company in Roy, Fergus County, mined a 180-t underground bulk sample from its deposit on Linster Peak in the Judith Mountains east of Hilger. Drilling results from the deposit have indicated a zone width of 1.8 to 2.4 m with grades ranging from 6.9 to 10 g/t gold. Full results on the bulk sample were not available by yearend.

Mandalay Ventures Ltd., Vancouver, British Columbia, Canada, tested for the boundaries of a previously exposed pay zone in the Quartz Creek placer gold deposit near Superior. The infrastructure was developed for an exploration program, but beyond some minor testing along the edges, the testing was not completed.

In the Elliston area, exploration was conducted for placer gold in the drainage from the Uncle Ben Gulch. This deposit has yielded some outstanding nuggets in recent years using metal detectors. Results of the current tests were not available by yearend.

In the Garnet area, Granite County, Contact Mining Company processed part of the Grant and Hartford gold-silver mine tailings through their mill. Results were reportedly encouraging and further development was expected.

East of Jefferson City, placer tests were conducted on the Golden Age property near Bullock Hill. Earlier studies identified the existence of resources in a residual placer deposit on the hillside but did not fully explore the limits or grades of the deposit.

West of Philipsburg, tests were conducted to determine the presence of sapphire in Little Moffit Gulch. The trenches showed significant geologic potential for sapphire but because of a limited water supply, processing was delayed until 2006.

South of Melrose, Barton Mines Company, LLC, Glens Falls, NY, auger-drilled the garnet tailings at the reclaimed mill site of the General Electric Company, Fairfield, CT. This facility had been used to process ore from the Browns Lake and Calvert Hill tungsten properties. Results of previous tests of this waste material have shown it to be very effective for water-jet cutting of various steels and aluminum. The drilling program outlined a garnet resource in excess of 1.4 million metric tons (Mt).

West of Marysville, Montana Molybdenum, Inc. (a wholly owned subsidiary of United Bolero Development Corp., Vancouver, British Columbia, Canada) conducted a 50-hole percussion drill program on the Bald Butte molybdenum deposit. Results ranged from 0.049% to 0.217% molybdenum with identified resources of about 460,000 t. In December, the company shipped some test lots to the Contact Mining Company mill in Philipsburg.

Near Nye, Trend Mining Company, Coeur d'Alene, ID, conducted drilling tests at the Mountain View, Stillwater County, property in their continuing search for platinum-group-metal deposits. Beartooth Platinum Corp., Toronto, Ontario, Canada, continued exploration activities in the Fishtail Creek area. Following geologic mapping of the area and the completion of a soil sampling program, the company conducted diamond drilling tests totaling 885 m but failed to intercept their target. It was anticipated that the drilling program would continue in 2006.

Graymont Western US, Inc., Bellingham, WA, initiated an 1,800-m diamond-drill exploration program to examine limestone resources on and adjacent to the National Guard firing range in Broadwater County. This was in conjunction with a proposal to transfer the management of the firing range from the U.S. Bureau of Land Management to the U.S. Army Corps of Engineers. Preliminary results of the drilling showed that the grade and thickness of the resources increased to the southwest near Radersburg.

Commodity Review

Industrial Minerals

Cement.—Near Three Forks, Holcim Ltd., Zurich, Switzerland, had a banner year at its Trident cement plant. Production was the highest in 6 years and all products were sold out. The company initiated rationing because of production shortfalls. Current consumption and production rates were projected to continue into 2006. The company's alternative fuel draft environmental impact statement was expected to be released in November or December 2006.

Modifications to the kiln dust recovery system at the Trident plant were expected to allow more dust to be sold as usable product material instead of being placed in a landfill. Holcim also leased the Sheep Creek iron deposit north of White Sulphur Springs. The company planned to campaign the mining of about 14,500 t of iron ore every other year and to maintain a stockpile at the cement plant.

Garnet.—Ruby Valley Garnet, LLC encountered some difficulties in quality control during 2005 at its plant near Alder. Under a new mill manager, the company subsequently undertook an extensive redesign of the recovery facilities. The plant was expected to be back in production by the second quarter of 2006 with the ability to produce blast, filtration, and waterjet media far superior to those previously produced. The grade of garnet at Ruby Valley appears to be more than 20% in the placer and somewhat higher in the newly discovered lode deposit. There currently is an estimated 30-year reserve in the placer, assuming a production rate of 18,000 metric tons per year (t/yr) of product. In general, the market demand for garnet far exceeds production in the northwestern United States. A small company such as Ruby Valley is positioned to compete for a significant portion of the garnet market.

Lime.—East of Townsend, Graymont Western continued production at its Indian Creek burnt lime operation. Demand remained firm during the year as the plant production level

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reached an estimated 70% of capacity. Sales have increased steadily during the past 3 years, and prices have been fairly stable. The Graymont operation currently provides 23% of the Broadwater County tax base.

Talc.—Barretts Minerals, Inc. continued production at its talc plant and at two mines south of Dillon. Operations were focused at the Regal Mine while stripping of a slide was completed at the Treasure Mine. At the Regal Mine, the county road was scheduled to be redirected during the summer of 2006. Upon completion, the road will serve to separate the public from the mine production area and will increase safety for all parties. The company began the permitting process for a dump and a discharge system and has received a permit for an ore-staging pad on the Stone Creek road. A new contractor will move ore from the pit to the staging area in 40-ton articulated trucks.

At the talc processing facilities, improvements were completed in the medium-grind circuit and in the packaging system. The products produced by Barretts Minerals are used in the matrix of catalytic converters, and in ceramics, construction materials, paints and coatings, pharmaceuticals, and plastics. The market was strong in these end-use sectors, showing a 10% increase in demand for the year. A shift toward the use of domestic rather than imported ores as feed material was noted. In addition, some interest was shown for using chloritic ores.

Luzenac America Inc. produced talc from its Yellowstone Mine south of Ennis. During the year several new pieces of equipment were acquired, and employment was increased. In addition, a permitting process was begun to expand the waste-rock dump, and a mine stripping project was completed. Luzanac was to be reorganized under Rio Tinto Minerals along with U.S. Borax Inc. (Rio Tinto Minerals, 2005).

Metals

Copper, Molybdenum, and Silver.—In northwest Montana, the Troy copper-silver mine operated by Genesis, Inc. (a subsidiary of Revett Silver Company, Spokane, WA) showed steady improvements. Diamond drilling results along the periphery of the existing deposit increased total proven and probable ore reserves from 7.9 to 10.9 Mt. Production lingered for many months at 2,270 metric tons per day (t/d) but appeared to be increasing by yearend. Although staffing was below full employment level for most of the year as a result of a tight labor market, the company was optimistic that a production level near the budgeted 5,900 t/d would soon be reached.

Operations were expected to continue on all three of the stacked ore bodies at the Troy Mine. All the new equipment ordered was received and placed into operation. Other than some difficulty in receiving parts in a timely manner, the operation appeared to be resolving the problems associated with new equipment and startup. The company was waiting for a new biological opinion from the U.S. Fish and Wildlife Service following a court case, which suspended their operating permit on the Rock Creek project based on an insufficient study of the environmental impacts on grizzly bear and bull trout. The opinion was expected to be issued before the second quarter of 2006 and development of the Rock Creek evaluation decline was expected to be underway before the yearend. The Rock Creek Mine would produce copper and silver from a stratiform deposit that underlies the Cabinet Mountain Wilderness.

On the east side of the Cabinet Wilderness south of Libby, Mines Management Inc., Spokane, WA, submitted a plan to mine the Montanore copper-silver deposit. A permit for this deposit was previously issued to the former Noranda Mining Company, Toronto, Ontario, Canada. Mines Management was awaiting the issuance of an environmental impact statement and a record of decision on the plan that was nearly identical to the plan previously approved for Noranda. The company finished a prefeasibility analysis and expected to complete a full feasibility study by late 2006.

The Contact Mill, a custom ore processing facility in Philipsburg that was owned by the Contact Mining Company, processed about 1,800 t of high-grade molybdenum ore from Winn-Eldridge's Ashdown Mine near Denio, NV. The mill is one of the few custom ore processing mills in the western United States. It has a processing capacity of 910 t/d in the grinding and flotation circuit and 455 t/d in the gravity separation circuit. A regrind circuit was completed in the third quarter, and a new unit was installed for drying the concentrates.

In Butte, Montana Resources, Inc. produced copper, molybdenum, and silver from the Continental Pit Mine. Ore grades remained steady at 0.20% copper and 0.025% molybdenum. Assembly of a 31-cubic-meter electric shovel was completed and placed into production in late summer. Significant improvements were made at the mill in upgrading the electric circuitry and computer controls. A plan was also in place to upgrade the ancillary equipment at the mine and mill during 2006.

Montana Resources also began investigating the feasibility of starting production in the supergene zone between the Berkeley Pit and the Continental Pit. Pumping tests were started late in 2005 and a drilling program was planned for 2006. Pending favorable results, production of copper was expected to be substantially increased at the mine.

Gold.—Near Whitehall, Placer Dome, Inc., Vancouver, British Columbia, Canada, operated the Golden Sunlight Mine. In the stripping process for the stage 5B expansion, a low-grade ore body was encountered. This allowed the company to reopen the mill in January. The reserves for 2005 were slightly less than 10 Mt at a grade of 2.19 g/t gold. The reserves were estimated to be 7.6 Mt at a grade of 2.78 g/t gold for 2006. Placer Dome planned to reopen the underground mine in November 2006 and to mine the open pit and underground sections at the same time until closure, which is scheduled after 2009.

The company had conducted exploration activities at the mine site and had identified four targets to be drilled in 2006. They hoped to identify all available reserves onsite prior to decommissioning the facility.

During 2005, some pit-wall stability problems were encountered on the west side of the pit. These appeared to be caused by wedge failures and ground water pressures. The company subsequently established a sophisticated computer-controlled continuous monitoring system of the pit walls for the safety of the employees.

Lead and Zinc.—Colorado-based Apollo Gold Corporation briefly resumed full production at the Montana Tunnels open

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pit gold mine north of Boulder, where gold and silver dore and lead-gold and zinc-gold concentrates were produced. After completing an extensive stripping project, the company settled into production from the main diatreme ore zone. However, pit-wall stability problems from toppling of waste rock on the east and south walls resulted in damage to two pickup trucks and a haul truck, causing the company to shut down mining operations. A geotechnical consultant was then hired to survey the problem and suggest a solution. The pit was redesigned, which resulted in a reduction of the slope angle of the problem walls while prestripping for the next mining stage. Subsequently, a profitable processing of rock from the waste dump was resumed at the mill during the third quarter of the year. Efforts to acquire sufficient funds to resume a full stripping project at the mine were begun late in the year.

Platinum-Group Metals.—Stillwater Mining Company was well into a significant development program at its East Boulder platinum-group-metals mine where cobalt, copper, gold, and nickel also were recovered. The longest, largest-diameter, single-pass Alimak raise in North America was completed and construction of a second raise was initiated during the year. The overall development program included construction of primary ramps and an upper-level sand backfill plant, as well as diamond drilling. The completed ventilation raise facilitated the ventilation needed for the rest of the development.

The shallow-dipping (approximately 45° to 50°) mineralized zone resulted in extensive ore dilution when longhole mining methods were used. The company continued to test Coeur d'Alene type cut-and-fill mining methods or some modification thereof with success. Mine production reached nearly 1,200 t/d, with both ore grade and percent metal recovery remaining stable. Results of diamond drilling indicated a substantial increase in ore reserves at the East Boulder Mine.

The production level at Stillwater Mining Company's Stillwater Mine near Nye was maintained during the year as the company continued with exploration and development programs to expand reserves. Employment of adequate numbers of skilled miners, and timely acquisition of certain supplies remained as problems affecting overall operations at the facilities.

Stillwater's smelter capability was expanded to include the recycling of catalytic converters from automotive salvage. The catalytic converter cores are used as part of the flux for processing the mine concentrates.

Legislation and Government Programs

The Montana Environmental Information Center and the Fort Belknap Tribe petitioned the Department of Environmental Quality to change the permitting regulations for mining projects. Specifically, the petition requested revision of the permitting regulations to state that projects unable to prove that no further water treatment would be necessary 2 years after final reclamation should not be permitted. It was the collective opinion of the mining industry, however, that if this revision were to be made, no further metal mining project permits would be issued. Industrial minerals mining projects also could be prohibited under the revised permitting regulations if nitrates from waste-rock dumps and reclamation sediment were considered to require some passive water treatment. This pending issue was causing considerable concern for the existing mining industry, as well as for the exploration companies either currently conducting or planning to conduct exploration and development activities within the State.

The Underground Miner Training Project students at Montana Tech completed 61 m of decline and drift at the Orphan Girl Mine in Butte. Blue Range Engineering reopened the 30-m level at the mine and was in the process of developing an underground mine exhibit that was expected to open in the summer of 2006. This work was done at the World Museum of Mining as part of its new theme that documents the technological development of the mining industry over time.

The Montana Bureau of Mines and Geology continued its active participation in the STATEMAP program, a component of the congressionally mandated National Cooperative Geologic Mapping Program (NCGMP), through which the USGS distributes Federal funds to support geologic mapping efforts through a competitive funding process. The NCGMP has three primary components: (1) FEDMAP, which funds Federal geologic mapping projects, (2) STATEMAP, which is a matching-funds grant program with State geological surveys, and (3) EDMAP, a matching-funds grant program with universities that has a goal to train the next generation of geologic mappers. During 2005, mapping geology was carried out in western and southwestern portions of the State under both the STATEMAP and EDMAP programs. Many of the activities were designed to create more detailed 1:100,000 and 1:24,000-scale maps from 1:250,000- scale maps previously published. Development of a new State geologic map was progressing with a finished product expected in the near future. Field mapping of both gold and sapphire placers was continuing, although the completed reports were not immediately anticipated. Current publications and activities can be accessed at http://www.mbmg.mtech.edu/.

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Rio Tinto Minerals, 2005, World leaders in borates, talc and salt combine to form Rio Tinto Minerals: Valencia, California, Rio Tinto Minerals press release, November 8, 1 p.

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TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN MONTANA[1, 2]

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral		2003 Quantity	2003 Value	2004 Quantity	2004 Value	2005 Quantity	2005 Value
Clays, bentonite		181	14,900	102	8,400	128	5,440
Gemstones		NA	707	NA	653	NA	644
Palladium[3]	kilograms	14,000	91,400	13,700	102,000	13,300	87,100
Platinum[3]	do.	4,170	93,100	4,040	110,000	3,920	113,000
Sand and gravel, construction		15,200	74,200	14,400	80,000	14,000	83,600
Stone:							
Crushed		3,060	12,200	4,090	13,700 r	3,540	16,800
Dimension		14	2,590	14	2,550	12	2,620
Combined values of cadmium (byproduct in zinc concentrates [2004-05]), cement [masonry (2003, 2005), portland], clays (common), copper, garnet (industrial [2005]), gold, lead, lime, molybdenum concentrates, peat, silver, talc (crude), zinc		XX	205,000	XX	303,000 r	XX	538,000
Total		XX	494,000	XX	621,000 r	XX	847,000

rRevised. NA Not available. XX Not applicable.
[1]Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2]Data are rounded to no more than three significant digits; may not add to totals shown.
[3]Recoverable content of ores, etc.

TABLE 2
MONTANA: CRUSHED STONE SOLD OR USED, BY KIND[1]

Kind	2004 Number of quarries	2004 Quantity (thousand metric tons)	2004 Value (thousands)	2005 Number of quarries	2005 Quantity (thousand metric tons)	2005 Value (thousands)
Limestone	8	2,960	$9,820 r	4	2,550	$12,500
Marble	2	W	W	--	--	--
Granite	3	W	W	3	W	W
Sandstone and quartzite	2	43 r	189 r	1	34	164
Traprock	2	212	822	2	W	W
Volcanic cinder and scoria	1	W	W	1	W	W
Miscellaneous stone	10 r	140 r	514 r	12	254	1,010
Total	XX	4,090	13,700 r	XX	3,540	16,800

rRevised. W Withheld to avoid disclosing company proprietary data; included in "Total." XX Not applicable. -- Zero.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.

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TABLE 3
MONTANA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2005, BY USE[1]

(Thousand metric tons and thousand dollars)

Use	Quantity	Value
Construction:		
Concrete aggregate (+1½ inch), riprap and jetty stone	W	W
Coarse aggregate graded:		
Concrete aggregate, coarse	W	W
Railroad ballast	W	W
Coarse and fine aggregates:		
Graded road base or subbase	W	W
Crusher run or fill or waste	W	W
Other construction materials	30	240
Agricultural, poultry grit and mineral food	W	W
Chemical and metallurgical:		
Cement manufacture	W	W
Lime manufacture	W	W
Sulfur oxide removal	W	W
Special, mine dusting or acid water treatment	W	W
Other miscellaneous uses and specified uses not listed	195	845
Unspecified:[2]		
Reported	127	543
Estimated	1,500	7,000
Total	1,600	7,490
Grand total	3,540	16,800

W Withheld to avoid disclosing company proprietary data; included in "Grand total."
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Reported and estimated production without a breakdown by end use.

TABLE 4
MONTANA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2005, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

	District 1		District 2		Unspecified districts	
Use	Quantity	Value	Quantity	Value	Quantity	Value
Construction:						
Coarse aggregate (+1½ inch)[2]	W	W	W	W	--	--
Coarse aggregate, graded[3]	W	W	W	W	--	--
Coarse and fine aggregates[4]	W	W	W	W	--	--
Other construction materials	30	237	(5)	3	--	--
Agricultural[6]	--	--	W	W	--	--
Chemical and metallurgical[7]	W	W	W	W	--	--
Special[8]	--	--	W	W	--	--
Other miscellaneous uses	--	--	195	845	--	--
Unspecified:[9]						
Reported	126	539	--	--	1	5
Estimated	1,300	6,500	127	462	--	--
Total	2,630	12,600	900	4,250	1	5

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes riprap and jetty stone.
[3]Includes concrete aggregate (coarse) and railroad ballast.
[4]Includes crusher run or fill or waste and graded road base or subbase.
[5]Less than ½ unit.
[6]Includes poultry grit and mineral food.
[7]Includes cement and lime manufacture and sulfur oxide removal.
[8]Includes mine dusting or acid water treatment.
[9]Reported and estimated production without a breakdown by end use.

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TABLE 5
MONTANA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2005,
BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregates and concrete products[2]	1,030	$8,120	$7.86
Asphaltic concrete aggregates and other bituminous mixtures	852	10,700	12.54
Road base and coverings	3,160	16,800	5.32
Fill	967	4,540	4.70
Snow and ice control	45	164	3.64
Other miscellaneous uses[3]	662	3,100	4.68
Unspecified:[4]			
Reported	2,380	12,600	5.31
Estimated	4,900	27,500	5.62
Total or average	14,000	83,600	5.97

[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.
[2]Includes plaster and gunite sands.
[3]Includes railroad ballast.
[4]Reported and estimated production without a breakdown by end use.

TABLE 6
MONTANA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2005, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		Unspecified districts	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products[2]	844	6,870	188	1,260	--	--
Asphaltic concrete aggregates and other bituminous mixtures	W	W	W	W	123	510
Road base and coverings	2,120	12,500	724	2,770	323	1,550
Snow and ice control	45	164	--	--	--	--
Other miscellaneous uses[3]	2,210	17,300	146	538	--	--
Unspecified:[4]						
Reported	694	3,800	1,690	8,830	1	5
Estimated	4,000	22,300	900	5,200	--	--
Total	9,870	62,900	3,670	18,600	447	2,070

W Withheld to avoid disclosing company proprietary data; included with "Other Miscellaneous Uses. -- Zero.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes plaster and gunite sands.
[3]Includes fill and railroad ballast.
[4]Reported and estimated production without a breakdown by end use.

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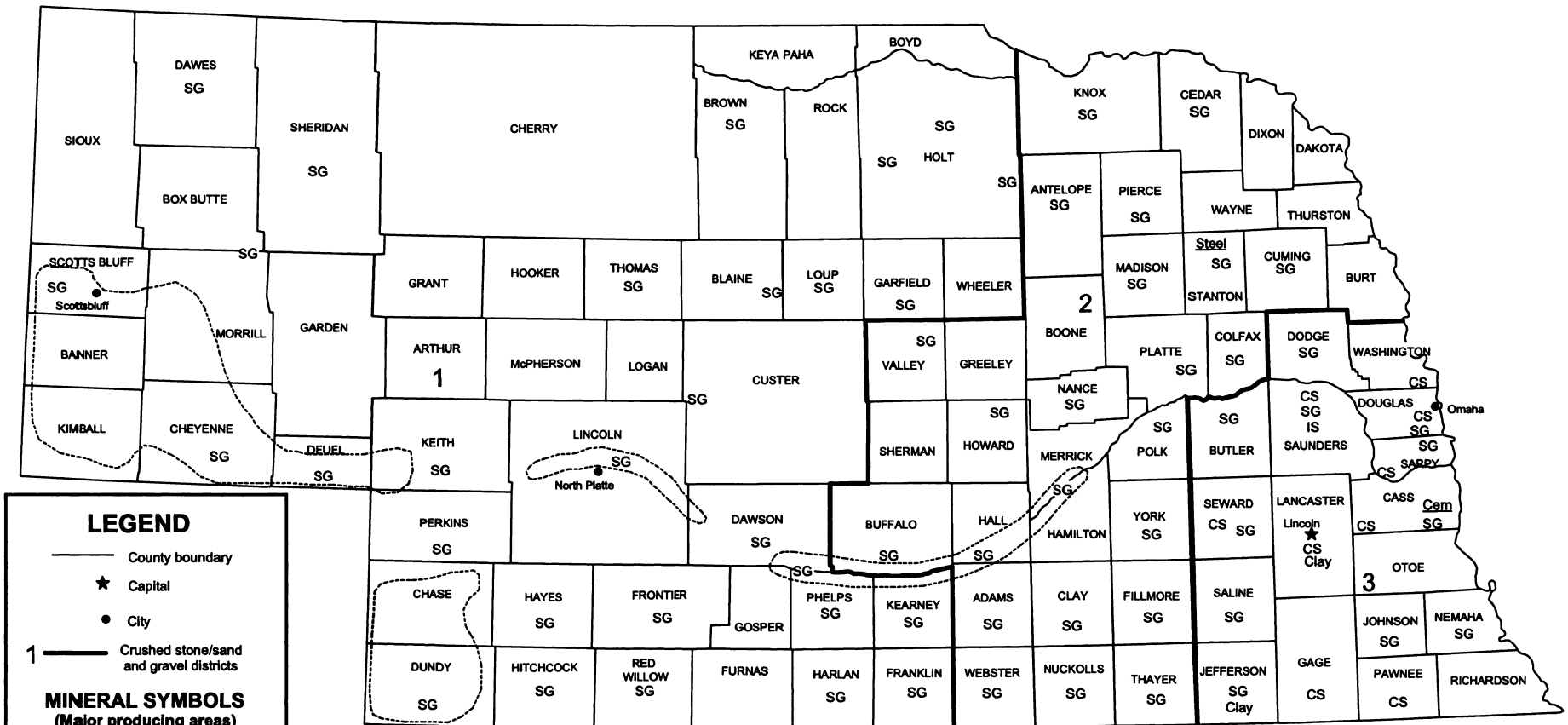
NEBRASKA



LEGEND

- County boundary
- ★ Capital
- ● City
- 1 ——— Crushed stone/sand and gravel districts

MINERAL SYMBOLS
(Major producing areas)

Cem	Cement plant
Clay	Common clay
Clay	Clay plant
CS	Crushed stone
IS	Industrial sand
Lime	Lime plant
SG	Construction sand and gravel
Steel	Steel plant
⬭	Concentration of mineral operations

Source: University of Nebraska-Lincoln, Nebraska Geological Survey/U.S. Geological Survey (2005)

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THE MINERAL INDUSTRY OF NEBRASKA

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the University of Nebraska-Lincoln, Nebraska Geological Survey, for collecting information on all nonfuel minerals.

In 2005, Nebraska's nonfuel raw mineral production[1] was valued at $110 million, based upon annual U.S. Geological Survey (USGS) data. This was a 3.8% increase compared with that of 2004, which increased by more than 11% from that of 2003. [The State's actual total nonfuel mineral values for 2003-05 were substantially higher than those reported in table 1, from which specific production values for masonry and portland cement, industrial sand and gravel (2003-04), and common clays (2005) were withheld to protect company proprietary data.]

In 2005, Nebraska's leading nonfuel mineral commodities were, in descending order of value, cement, construction sand and gravel, and crushed stone. Construction sand and gravel led the way in the State's increase in total nonfuel mineral value for the year. Although the quantity of construction sand and gravel produced decreased by nearly 5%, a 20% increase in the average price per metric ton generated a 13%, or $7 million increase in the commodity's total value from that of 2004. Smaller yet significant increases also took place in portland cement and common clays (company proprietary data). The only significant decrease in value for a nonfuel commodity was that of crushed stone which, despite a marginal increase in production, had a $2.6 million decrease in its total value from that of 2004 (table 1). Nebraska continued to be a producer of significant quantities of construction sand and gravel in 2005 compared with other producing States. Metals that were produced in the State—mostly raw steel—were processed from materials acquired from other domestic and foreign sources.

The following narrative information was provided by the Nebraska Geological Survey[2] (NGS) the Conservation and Survey Division of the University of Nebraska-Lincoln.

Commodity Review

Industrial Minerals

Aggregates.—Rinker Materials Corporation Ft. Calhoun Stone (Ft. Calhoun) closed operations at its West Quarry and moved limestone processing equipment to its East Quarry along the Missouri River. The operation's wash plant and barge loadout facility were upgraded in order to increase productivity and efficiency. A county road was armor coated to extend its life and reduce wear and tear on truck traffic going in and out of the facility on nearby U.S. Highway 75. In 2005, Rinker Materials continued its support of local high school booster clubs and 4-H clubs and donated crushed stone and limestone fines to nonprofit organizations. Rinker also cooperated with the Washington County, NE, Gateway Development Corporation, which promotes business expansions, capital investments, and economic opportunities in the area.

Cement.—Ash Grove Cement Company's Louisville plant completed a $1.7 million refurbishment of its central control room, with new computers, software, and high-definition flat-screen control monitors. The plant also purchased a 125-metric-ton (t) 1,500-horsepower General Electric diesel locomotive to move railcars in the plant's switchyard. Ash Grove supplied cement for concrete used in a variety of large construction projects, including the $50 million Tom and Nancy Osborne Athletic Complex at the University of Nebraska-Lincoln and the elevated West Dodge Road project in Omaha, the largest ever road project bid in Nebraska. In early 2005, Ash Grove's Midwest Region North Sales Office in Omaha reached one million tons of cement and cement blends sold.

Although the Nebraska Department of Roads (NDOR) specifications still prohibit the use of Class "C" fly ash in pavement concrete, an increase in the use of fly ash in soil stabilization efforts associated with NDOR activities began in 2005.

Clay and Clay Products.—Yankee Hill Brick and Tile (Lincoln) tested and developed new products and sizes in its new plant, including king size, queen size, and hollow and thin brick. The company provided bricks for projects in the Omaha metropolitan area, local schools, the University of Nebraska, and numerous out-of-State projects. Yankee Hill supplied more than 5 million facing bricks to a $1 billion biotechnology research center on the North Carolina Research Campus in Kannapolis, NC.

Lime.—ILC Resources (Weeping Water) increased its production of feed-grade calcium carbonate from 2004; however, rising fuel prices have been a serious concern for all mineral producers. Agricultural lime sales began to increase as a result of corn ethanol prospects during 2005. The trend is likely to continue as corn prices increase.

Metals

Nucor Steel-Nebraska (Vulcraft Cold Finish Division) of Norfolk, employed 415 workers, recycled about 0.94 million metric tons (Mt) 1.03 (million short tons) of scrap steel in 2005 at a 99% recycled rate for its product. The company sponsored a 2005 Household Scrap Recycling Day program on May 7, 2005, and recovered 32 t (35 short tons) of steel scrap and 4,350 kilograms (kg) (9,600 pounds) of aluminum cans. Two-hundred and forty-five vehicles and 180 air-conditioning units,

[1]The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2005 USGS mineral production data published in this chapter are those available as of December 2006. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—can be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

[2]Matthew Joeckel, Research Geologist with the University of Nebraska-Lincoln and the Nebraska Geological Survey (NGS), authored the text of the State mineral industry information provided by the NGS.

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freezers, and refrigerators, were collected; the air-conditioners and freezers were sent to a special facility in order to safely recover chlorofluorocarbon coolants. In October 2005, Nucor Steel-Nebraska was awarded first place in the Business Industry division of the Keep Nebraska Beautiful Awards program for its successes during its Household Scrap Recycling Day. On August 30, 2005, Nucor Steel-Nebraska sponsored a town hall meeting to increase political awareness about environmental issues and trade policies, and the real and potential effects on China's economic growth on the steel industry. In excess of 3,000 citizens attended the meeting as well as Nebraska Senator Ben Nelson and Nucor CEO Dan DiMicco.

Mineral Fuels and Related Materials

Uranium.—Crow Butte Resources, Inc. produced 377,000 kg (or nearly 832,000 pounds) of uranium in 2005, an increase compared with 2004 production. Dramatic rises in uranium prices benefited the company. However, prices stipulated in long-term contracts were significantly below recent spot prices. Nonetheless, the published transaction price for uranium increased from $20.06 per pound in December 2004 to $34.55 per pound in December 2005. Ground water restoration at Crow Butte's Mine Units (Wellfields) No. 3 and No. 4 was initiated. Ground water restoration in Unit 2 was completed, and a full report on its completion was to be registered with the State of Nebraska.

Environmental and Safety Issues

Environmental Technologies.—Ash Grove Cement plant Louisville, NE, conducted a test burn of some 28,000 scrap tires in a tire coal mix in its Humboldt kiln during the summer of 2005. Data concerning emissions from the test burn of tire-derived fuel (TDF) were released by the Nebraska Department of Environmental Quality (NDEQ) in mid-October 2005. Compared with coal only baseline kiln burn, emissions of nitrogen oxides decreased from 145 kilograms per hour (kg/hr) to 89 kg/hr, sulfur oxide emissions decreased from 170 kg/hr to 70 kg/hr, and hourly dust production rates fell by 28% in the test burn of TDF coal mixture. Carbon monoxide emissions, however, decreased only slightly from the coal only baseline. TDF stack tests indicated minimal emissions of arsenic, barium, benzene, beryllium, cadmium, furans, Hexavalent chromium, hydrochloric acid, lead, manganese, mercury, nickel, polychlorinated biphenyls, selenium, and zinc. The tested levels of all of these constituents were well below the EPA Region 9 acceptable thresholds. The company will seek a permit from the State of Nebraska to burn tires regularly as 10% to 20% of the plant's fuel supply, indicating that it would follow public comment procedures established by the NDEQ.

Martin Marietta Materials' Weeping Water Mine was selected runner-up in the 2005 Sentinel of Safety Awards, Large Underground Nonmetal Group, along with only three other operations in the United States. The Weeping Water Mine registered 146,295 hours without a single lost-time injury. An additional 46 Nebraska aggregate operations were recognized for hours without lost-time injuries in the Sentinel of Safety Awards. Included in this group were Rinker Materials Corporation, Ft. Calhoun (70,041 hours in the Large Quarry Group and 44,644 hours in the Large Metal-Nonmetal Mill Group), Kerford Limestone (60,733 hours in the Large Metal-Nonmetal Mill Group), Martin Marietta Materials' Weeping Water Mine (36,462 hours in the Large Metal-Nonmetal Mill Group), Lyman-Richey's Gretna (24,085 hours in the Large Dredge Group), and Omaha sand and gravel operations (23,691 hours in the Large Dredge Group).

Government Programs

The Conservation and Survey Division (NGS) merged into the School of Natural Resources at the University of Nebraska-Lincoln (UN-L) and was firmly scheduled to move into new quarters at Hardin Hall on the East Campus of UN-L by the end of August 2006. New facilities at Hardin Hall were to include a core description, petrography, and x-ray diffraction laboratories.

The Conservation and Survey Division's USGS STATEMAP cooperative mapping efforts continued during 2005. The STATEMAP program is a component of the USGS National Cooperative Mapping Program congressionally mandated National Cooperative Geologic Mapping Program (NCGMP), which distributes Federal funds to support geologic mapping efforts through a competitive funding process. The NCGMP has three primary components: (1) FEDMAP, which funds Federal geologic mapping projects; (2) STATEMAP, which is a matching-funds grant program with State geological surveys; and (3) EDMAP, a matching-funds grant program with universities that has a goal to train the next generation of geologic mappers.

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TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN NEBRASKA[1,2]

(Thousand metric tons and thousand dollars)

Mineral	2003 Quantity	2003 Value	2004 Quantity	2004 Value	2005 Quantity	2005 Value
Cement:						
Masonry	W	(3)	W	(3)	W	(3)
Portland	W	(3)	W	(3)	W	(3)
Clays, common	133 e	338 e	133 e	338 e	160 e	(3)
Gemstones	NA	4	NA	4	NA	4
Lime	8	692	11	514	12	625
Sand and gravel:						
Construction	13,300	45,000	15,100	53,200	14,300	60,200
Industrial	W	(3)	W	(3)	--	--
Stone, crushed	6,960	49,200	6,900	51,900	6,950	49,300
Total	XX	95,300	XX	106,000	XX	110,000

eEstimated. NA Not available. W Withheld to avoid disclosing company proprietary data. XX Not applicable. -- Zero.
[1]Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2]Data are rounded to no more than three significant digits; may not add to totals shown.
[3]Value excluded to avoid disclosing company proprietary data.

TABLE 2
NEBRASKA: CRUSHED STONE SOLD OR USED, BY KIND[1]

Kind	2004 Number of quarries	2004 Quantity (thousand metric tons)	2004 Value (thousands)	2005 Number of quarries	2005 Quantity (thousand metric tons)	2005 Value (thousands)
Limestone	9	6,900	$51,900	9	6,950	$49,300

[1]Data are rounded to no more than three significant digits.

TABLE 3
NEBRASKA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2005, BY USE[1]

(Thousand metric tons and thousand dollars)

Use	Quantity	Value
Construction:		
Coarse aggregate (+1½ inch), riprap and jetty stone	W	W
Coarse aggregate, graded:		
Concrete aggregate, coarse	W	W
Bituminous aggregate, coarse	W	W
Coarse and fine aggregates:		
Graded road base or subbase	W	W
Crusher run or fill or waste	W	W
Roofing granules	W	W
Other coarse and fine aggregates	W	W
Agricultural:		
Agricultural limestone	W	W
Other agricultural uses	W	W
Chemical and metallurgical, cement manufacture	W	W
Special, asphalt fillers or extenders	W	W
Unspecified: Reported[2]	4,410	31,500
Total	6,950	49,300

W Withheld to avoid disclosing company proprietary data; included in "Total."
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Reported production without a breakdown by end use.

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TABLE 4
NEBRASKA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2005, BY USE AND DISTRICT[1, 2]

(Thousand metric tons and thousand dollars)

Use	District 3	
	Quantity	Value
Construction:		
Coarse aggregate (+1½ inch)[3]	W	W
Coarse aggregate, graded[4]	W	W
Coarse and fine aggregate[5]	W	W
Agricultural[6]	W	W
Chemical and metallurgical[7]	W	W
S grcial[8]	W	W
Unspecified: Reported[9]	4,410	31,500
Total	6,950	49,300

W Withheld to avoid disclosing company proprietary data; included in "Total."
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]No production reported in Districts 2.
[3]Includes riprap and jetty stone.
[4]Includes bituminous aggregate (coarse) and concrete aggregate (coarse).
[5]Includes crusher run or fill or waste, graded road base or subbase, roofing granules, and other coarse and fine aggregates.
[6]Includes agricultural limestone and other agricultural uses.
[7]Include cement manufacture.
[8]Includes asphalt fillers or extenders.
[9]Reported production without a breakdown by end use.

TABLE 5
NEBRASKA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2005,
BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	2,840	$11,700	$4.11
Plaster and gunite sands	74	224	3.05
Concrete products (blocks, bricks, pipe, decorative, etc.)	104	475	4.57
Asphaltic concrete aggregates and other bituminous mixtures	503	3,800	7.55
Road base and coverings[2]	1,960	9,060	4.62
Fill	775	1,830	2.36
Snow and ice control	139	729	5.24
Other miscellaneous uses[3]	67	1,080	16.12
Unspecified:[4]			
Reported	1,230	5,170	4.20
Estimated	6,600	26,200	3.98
Total or average	14,300	60,200	4.22

[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.
[2]Includes road and other stabilization, lime.
[3]Includes roofing granules.
[4]Reported and estimated production without a breakdown by end use.

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TABLE 6

NEBRASKA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2005, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregates and concrete products[2]	388	1,380	W	W	W	W
Asphaltic concrete aggregates and road base materials	671	2,550	W	W	W	W
Fill	29	65	274	568	472	1,200
Snow and ice control	44	160	15	53	80	517
Other miscellaneous uses[4]	24	610	2,170	11,200	2,290	10,600
Unspecified:[5]						
Reported	47	381	59	306	1,120	4,480
Estimated	1,600	6,300	2,400	9,700	2,600	10,200
Total	2,780	11,500	4,960	21,800	6,540	27,000

W Withheld to avoid disclosing company proprietary data; included in "Other miscellaneous uses."

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes plaster and gunite sands.

[3]Includes road and other stabilization, lime.

[4]Includes railroad ballast.

[5]Reported and estimated production without a breakdown by end use.

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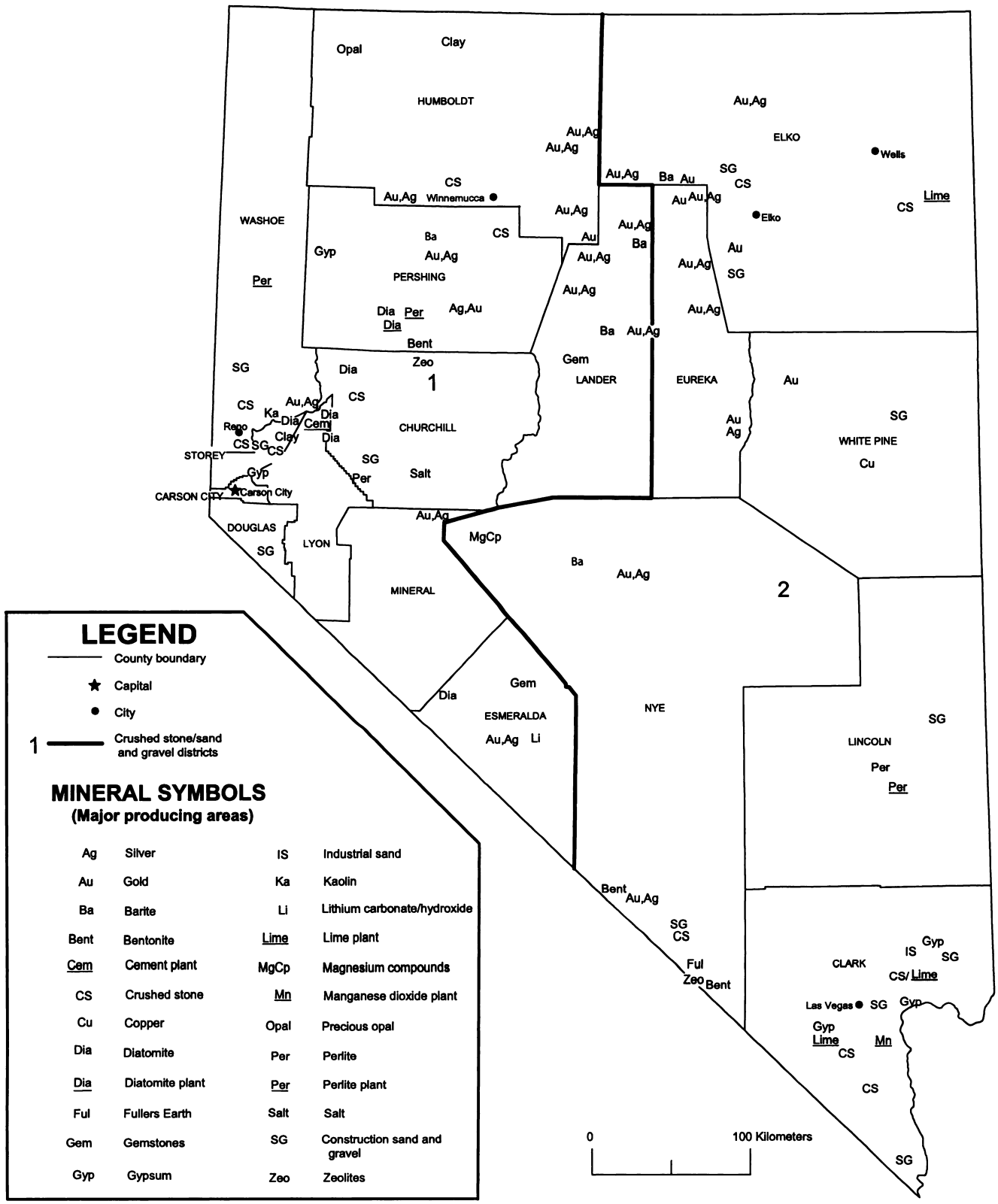
NEVADA



LEGEND

- County boundary
- ★ Capital
- ● City
- 1 ——— Crushed stone/sand and gravel districts

MINERAL SYMBOLS
(Major producing areas)

Ag	Silver	IS	Industrial sand
Au	Gold	Ka	Kaolin
Ba	Barite	Li	Lithium carbonate/hydroxide
Bent	Bentonite	Lime	Lime plant
Cem	Cement plant	MgCp	Magnesium compounds
CS	Crushed stone	Mn	Manganese dioxide plant
Cu	Copper	Opal	Precious opal
Dia	Diatomite	Per	Perlite
Dia	Diatomite plant	Per	Perlite plant
Ful	Fullers Earth	Salt	Salt
Gem	Gemstones	SG	Construction sand and gravel
Gyp	Gypsum	Zeo	Zeolites

Source: Nevada Bureau of Mines and Geology/U.S. Geological Survey (2005)

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THE MINERAL INDUSTRY OF NEVADA

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Nevada Bureau of Mines and Geology for collecting information on all nonfuel minerals.

In 2005, Nevada's nonfuel raw mineral production was valued1 at $3.88 billion, based upon annual U.S. Geological Survey (USGS) data. This was an increase of $410 million, a nearly 12% rise from that of 2004, following an 8.8% increase from 2003 to 2004. It was also an alltime high for the State, principally being the result of increases in the price of gold, increases in the production and average price of copper, and an increase in construction sand and gravel production. The State ranked third in the Nation in total nonfuel mineral production value in 2005, which followed rankings of second for the previous 6 years and first in 1993 and 1998. Nevada accounted for more than 7% of the U.S. total nonfuel value in 2005.

Nevada, which has led the Nation in gold production since 1981, provided nearly 83% of the Nation's gold in 2005. In 2005, gold accounted for 78% of the State's total nonfuel raw mineral production value, followed by construction sand and gravel with about 6%, copper (company proprietary data), and crushed stone and silver with about 2% each. For the fourth consecutive year, Nevada ranked second in silver production (first from 1987-2001) accounting for more than 22% of the silver produced from U.S. mines, down from 24% in 2004, 26% in 2003, and 30% in 2002.

In 2005, gold and copper led the State's rise in value with increases of about $180 million each. Gold production decreased modestly while that of copper jumped significantly as a result of increased production at the Quadra Mining Ltd.'s Robinson Mine, just west of Ely, White Pine County. In addition to the substantial increases in the values of gold and copper were a $33 million rise in the value of construction sand and gravel and also increases in the values of industrial sand and gravel and lime, up by more than 20% and about 17%, respectively. The unit values of these five nonfuel mineral commodities increased significantly, except that of constructions sand and gravel, which was down slightly. The large majority of the State's other nonfuel minerals had smaller increases in value. The largest decrease in value was in that of crushed stone, down $6 million (table 1). Although not significantly affecting the State's overall total nonfuel mineral value, the value of gemstone production was down about 17%.

In 2005, while Nevada continued to lead the Nation in the quantity of gold produced, it also continued to be the only State to produce magnesite and lithium carbonate minerals (minerals listed in descending order of value) and it remained first of two barite-producing States, second in silver and diatomite, third in gypsum, and 7th in gemstones (gemstones ranking based upon value). While Nevada rose in rank to fourth from fifth in the production of copper, to sixth from seventh in lime, and to sixth from eighth in construction sand and gravel, it decreased to fifth from sixth in zeolite production and was also the producer of significant quantities of industrial sand and gravel. Mercury was produced as a byproduct of gold-silver processing at several mines but output data were not available. Mercury has not been mined domestically as a primary mineral commodity since the closure of the McDermitt Mine in 1992 (Brooks and Matos, 2005§[2]).

The following narrative information was provided by the Nevada Bureau of Mines and Geology[3] (NBMG). Production data in the text that follows are those reported by the NBMG as measured by mine shipments, sales, or marketable production (including consumption by producers) and were compiled by the Nevada Commission on Mineral Resources Division of Minerals (NDM) and the Nevada Bureau of Mines and Geology, based upon those State agencies surveys and canvasses, estimates, and information gathered from company annual reports (Price and Meeuwig, 2006, p. 3). The NBMG data are reported by that agency to be nonproprietary and may differ from some USGS production figures as reported to and estimated by the USGS.

Industry Overview and Trends

Nevada produced the most gold in the shortest period of time in U.S. history. The recent surge in production in the United States largely has been the result of discoveries of Carlin-type gold deposits and other deposits (the large majority currently having been found in Nevada), in which gold occurs primarily in grains invisible to the naked eye. The U.S. production so far in the current period of substantial production (1981 to 2005) has been about 6,070 metric tons (t) [6.07 million kilograms (kg), or 195 million troy ounces], of which about 4,140 t (133 million troy ounces) have been produced in Nevada. This is significantly greater than the total production during the era of the California gold rush of 902 t (29 million troy ounces) from 1849 to 1859; Nevada's Comstock era of about 1,060 t (34 million troy ounces) from 1860 to 1875; and the time period from 1897 to 1920 when Goldfield (Nevada), the Black Hills (South Dakota), Cripple Creek (Colorado), and byproduct production from copper mines in Arizona and Utah contributed to cumulative production of more than 2,950 t (95 million troy ounces). U.S. production from 1996 to 2005 alone was more than 3,140 t (101 million troy ounces). The current surge in production is greater

[1]The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2005 USGS mineral production data published in this chapter are those available as of December 2006. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—can be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

[2]References that include a section mark (§) are found in the Internet References Cited section.

[3]Jonathan G. Price, the State Geologist, Richard O. Meeuwig, Editor and Webmaster, Stephen B. Castor, Research Geologist, and John L. Muntean, Research Economic Geologist, coauthored the text of the State mineral industry information provided by the Nevada Bureau of Mines and Geology.

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than previous time periods of substantial production not only in terms of cumulative production but also in terms of peak annual production 361 t (11.6 million troy ounces) in 1998 versus 149 t (4.8 million troy ounces) in 1909; 81 t (2.6 million troy ounces) in 1866; and about 96 t (3.1 million troy ounces) in 1853, and duration (at least 25 years for the current surge versus no more than 24 years for any of the earlier ones).

Aggregate production reached an alltime high in 2005 as a result of Nevada's expanding population and needs for construction materials for airports, highways, homes, resort hotels, schools, streets, and various businesses. Ongoing similar demand for construction raw materials was anticipated to continue because of Nevada's annually increasing population. According to the U.S. Census Bureau, Nevada's population reached 2.5 million by mid-2006, up 25% from 2.0 million in the 2000 census (U.S. Census Bureau, 2006§). Population growth was particularly strong in the Las Vegas metropolitan area (Clark County), where an average influx of 9 to 10 new residents per hour was resulting in approximately 0.81 hectares (ha) (two acres) per hour of land development for businesses, homes, and roads. A new cement plant, with production anticipated for 2008, was in the planning stages for the Las Vegas market.

A trend taking place nationwide as well as in the Las Vegas area was the combination of aggregate quarries with landfill operations. Planning for the eventual uses of quarries was vital in areas where urban expansion was also encroaching on the mineral resources. Local quarry resources were mined where practicable and economical in part to reduce transportation costs as well as concerns for highway safety. Post-mining land uses included suburban developments, landfills, and recreation areas. Gypsum mines near the urban growth areas of Las Vegas were being considered as sites for housing developments.

Employment

The mining industry directly employed 10,561 people in 2005. The average annual pay for mineral industry employees was $62,716 and was the highest average of any employment sector in the State. The industry was responsible for another 48,000 jobs related to providing the goods and services needed by the industry and its employees (Driesner and Coyner, 2006§). On the average, each of the 10,561 workers in the mining industry in Nevada produced approximately $361,000 in mined materials in 2005, an alltime high.

Exploration Activities, Discoveries, and Mine Development Activities

Nevada's exploration activities for industrial minerals continued in 2005 for construction sand and gravel, crushed stone, limestone, gypsum, perlite, silica, and vermiculite. Activities included exploration and the staking of mining claims.

Industrial Minerals

Aggregate (Construction Sand and Gravel, Crushed Stone).—In recent years, aggregate producers have staked mining claims on carbonate rock resources in the Las Vegas area. However, some of the material may be slated as feed for lime or cement operations. This trend was initiated in 2001 when Rinker Materials Inc. acquired claims on carbonate rocks in the Sloan area south of Las Vegas. In 2004, the U.S. Bureau of Land Management (BLM) completed a Mining Claim Validity Report on these claims, which included comparative testing of materials from the claims with similar material from producers of crushed carbonate rock in the Las Vegas area. On the basis of this report, the BLM challenged the claims in Federal court. As of yearend 2005, the matter was still under consideration.

Nevada Aggregate Holdings staked more than 100 lode claims and nearly 100 placer claims in 2005 over Paleozoic-age carbonate rock exposures in the Dry Canyon Range. These claims, which were presumably staked on aggregate resources, are in the vicinity of the Apex Landfill, which is the site of aggregate production for the Las Vegas metropolitan area. Companies that held claims on carbonate rocks or other aggregate materials in the Las Vegas area in 2005 include Aggregate Industries Management Inc. in the Sloan area, Sierra Ready Mix and Diamond Generating Corp. in the Ivanpah area, and Las Vegas Paving Corp. in the Dry Lake area. In 2005, Excalibar Minerals Inc., a Texas company that produces barite and calcium carbonate product, staked 30 claims in the Independence Mountains in Elko County. The claims were presumably staked for barite because they are in an area of barite prospects near Lone Mountain.

Gypsum.—In 2005, more than 130 eight-member placer claims were staked in the Snow Flake block in southeastern Lincoln County about 19 kilometers (km) (12 miles) northwest of Mesquite. The claims, which are in the area of the Snowhite gypsum prospect, were staked over an extensive surficial gypsum deposit on behalf of Federated Commercial Industries Inc. of Las Vegas.

Limestone.—Limestone suitable for cement production is widespread near Las Vegas and several attempts have been made in the past to initiate cement production in the area. Royal Cement Co. reported minor production between 2000 and 2002 at a cement plant near Logandale in Clark County. In 2004, Ash Grove Cement Co. made plans for a major cement plant northeast of Las Vegas on the Moapa Indian Reservation. The proposed source of limestone is from exposures of Devonian-age Sultan Limestone on the reservation. Proposed annual capacity of the plant, which was projected to cost $250 million, is 1.36 million metric tons (Mt) of cement. Construction was planned to begin in 2006 and be completed in 2008.

Perlite.—In 2005, S & B Industrial Minerals NA staked nearly 100 claims in Lincoln County near the Utah State line. No mineral deposits are known in the area. The company is one of the world's largest producers of perlite. S & B Industrial's claims were thought possibly to be for (not previously discovered) perlite deposits, or because the company is also a major clay producer in the area, staked on clay mineral resources.

Silica.—In 2005, James Hardie Building Products Inc. conducted an environmental assessment for the expansion of a small mineral materials sales operation at the Kramer Hill quartzite quarry near Golcondain, Humboldt County. The material was mined for testing and is under consideration as

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feed for the company's fiber cement siding manufacturing plant near Reno. The expansion proposal would cover the removal of as much as 3.6 Mt during a 20-year period from the property, which includes both public and private land. The company staked claims in the area in 2004 and added 10 claims in 2005.

Vermiculite.—IBI Corp., a junior international mining and investment company that operates a vermiculite mine in Africa, signed an option agreement in 2004 to purchase claims staked for vermiculite that cover an area of more than 486 ha (1,200 acres) near Mica Peak in Clark County. The vermiculite occurs in altered Precambrian-age rocks in three claim blocks that were originally staked in 1993 and 1994 and include a deposit that was mined on a small scale in the 1940s.

Metals

Significant increases in exploration in Nevada that began in 2004 continued throughout 2005. Including new claims and annual maintenance of existing claims, Nevada county recorders registered 166,952 claim filings in 2005, a 14.4% increase from that of 2004. A total of nearly 26,800 new claims were filed with the BLM in 2005, a 7% decrease from those of 2004. During 2005, intense staking campaigns were carried out in and around Placer Dome Inc.'s Bald Mountain Mine (White Pine County), in Kobeh Valley, in and around the McDermitt caldera, and in the Bottle Creek District across Desert Valley from the old Sleeper Mine in Humboldt County. In 2005, at least 110 projects were drilled, of which 38 different junior companies completed 60 projects; the rest were done by 12 major or mid-tier companies (Muntean, 2006, p. 13).

Gold.—The main exploration objective in Nevada continued to be gold. Major and mid-tier companies continued to focus exploration efforts in and around their active mines in 20054 (Muntean, 2006, p. 13). Most new mine reserves were the result of drilling that converted identified resources to reserves. In some cases, resources previously identified by the company were converted to reserves without drilling, simply because of the higher price of gold. Major drill programs were carried out in 2005 by Newmont Mining Corp. at its Leeville, Gold Quarry, Deep Post, Twin Creeks, and Midas Mines. Some known, but as yet undeveloped deposits were in the beginning stages of development. Newmont continued a major program at its Phoenix project in 2005 to put the mine into full production in 2006. The Phoenix Mine was expected to deliver an annual production of between 12,400 and 14,000 kg (400,000 troy ounces and 450,000 troy ounces) of gold as well as 8,160 and 9,070 t (18 million pounds to 20 million pounds) of copper (accounted for as a byproduct credit) during the anticipated 15-year mine life (Newmont Mining Corp., 2004§). Newmont was also in the process of permitting its Emigrant deposit, southeast of Carlin, Elko County, for a planned startup in 2007 or 2008.

Also in 2005, Barrick Gold Corp. drilled about 76,000 meters (m) (250,000 feet) in and around its Goldstrike Mine on the surface and underground. The Goldstrike Mine is located on the Carlin Trend in north-central Nevada about 40 km northwest of Elko. In addition to a major drill program at its East Archimedes project (a reopening of the Ruby Hill gold mine) near Eureka in 2005, Barrick started prestripping with production planned for 2007.

Other active mines with major drill programs in 2005 included Bald Mountain (Placer Dome), Cortez Joint Venture [Placer Dome (60%) and Kennecott Minerals Co. (40%)], Turquoise Ridge Joint Venture [Placer Dome (70%) and Newmont (30%)], Round Mountain Joint Venture [Kinross Gold Corp., (50%) and Barrick Gold (50%)], Marigold Joint Venture [Glamis Gold Ltd. (67%) and Barrick Gold (33%)], and Jerritt Canyon (Queenstake Resources Ltd.).

The Northumberland (Newmont Mining) and Ren (Centerra Gold Inc.) projects were the only major drill projects in 2005 undertaken by major or mid-tier companies outside of its active mines. Newmont was attempting to increase and convert to reserves an estimated resource of 62,000 kg (2 million troy ounces) of gold at Northumberland, located north of Round Mountain in Nye County. The company stood to earn a 60% interest in Northumberland in a joint venture with Nevada Western Gold Corp (a subsidiary of NewWest Resources Group, the owner of Northumberland), by investing $25 million in the project. Centerra Gold continued to explore the Ren deposit (in a joint venture with Barrick Gold) located in the northern Carlin trend. Drilling in 2005 increased the measured and indicated resource at Ren to 37,000 kg (1.2 million troy ounces) at a grade of about 13.6 grams per metric ton (g/t) (0.397 troy ounces per short ton) gold.

The discovery of the Cortez Hills deposit by Placer Dome in 2002 continued to fuel much of the investment in junior companies exploring in Nevada. Junior companies concentrated their efforts on the Battle Mountain-Eureka trend, and were either drilling their own properties, or joint venturing them with more major companies. In 2005, Placer continued to delimit the size of the Cortez Hills Placer Dome (60%) and Kennecott (40%) and to convert existing resources into declared reserves. Placer Dome estimated in September a bulk-minable reserve of 53.3 Mt of 2.71 g/t (0.079 troy ounces per short ton) gold ore at Cortez Hills, for about 172,000 kg gold (nearly 5.55 million troy ounces). An underground resource (measured and indicated) of 75,300 kg (more than 2.42 million troy ounces) gold at a grade of 14.4 g/t occurs beneath the bulk (open pit) minable reserve. A decline was planned for 2006 to begin converting the underground resources into reserves.

Other Metals.—Although gold still dominated the Nevada mining industry, companies were beginning to show interest in other metals. Although Quadra Mining Ltd., which reopened the Robinson copper mine in 2004, did no exploration in 2005, it was planning a significant program for 2006. The only other project in the State at which copper was the primary metal of interest was Aberdene Mine Ltd.'s New York Canyon project near Luning, Mineral County.

[4]As determined by the NBMG, the classification of companies into major, mid-tier, or junior in this section of the report is arbitrarily based on gold production and market capitalization. The loose criteria were as follows: 1) major companies produce greater than 1 million troy ounces of gold worldwide, and have market capitalizations of over $3 billion, 2) mid-tier companies produce between 50,000 and 1 million troy ounces of gold and have market capitalizations less than $3 billion, and 3) junior companies produce less than 50,000 troy ounces of gold and have market capitalizations less than $500 million.

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As a result of the high price of molybdenum, Golden Phoenix Minerals Inc. prepared the Ashdown Mine in northwestern Humboldt County to commence production in early 2006. In 2005, Golden Phoenix began a decline to take a bulk sample and built a small flotation mill onsite (Golden Phoenix Minerals Inc., 2006§). Idaho General Mines, Inc. was in the process of assessing whether to develop the Mount Hope porphyry molybdenum deposit north of Eureka and put it into production. Likewise in 2005, Augusta Resource Corp. was planning a drilling project at Mount Hamilton east of Eureka to assess whether the existing molybdenum-copper-tungsten-gold resources there could be put into production.

Despite high silver prices, Midway Gold Corp.'s Black Prince project in Lincoln County was the only reported silver project that was drilled in 2005. Piedmont Mining Company, Inc. and AuEx Ventures, Inc., which leased the property from Newmont Mining Co. in August, planned to evaluate remaining resources and potential at the old Trinity Silver Mine in Pershing County (AuEx Ventures Inc., 2005§).

Vanadium International staked 13 claims in search of vanadium deposits in the south part of the Fish Creek Range in northern Nye County. Interestingly, in a play reminiscent of the substantial increase in uranium exploration in the 1970s, Western Energy Development Corp. staked more than 2,000 claims in 2005 in the McDermitt caldera area west of McDermitt in Humboldt County with the objective of drilling for uranium in 2006.

Commodity Review

Industrial Minerals

Aggregate (Construction Sand and Gravel, Crushed Stone).—Nevada's statewide construction aggregate production based upon NBMG data was estimated to be 42 Mt, 15% more than production for 2004 (Castor, 2005§). This production had an approximate value of $207 million, well below that of gold and slightly less than the value of copper production. Aggregate production from construction sand and gravel deposits accounted for about 65% of aggregate production statewide, with crushed stone and lightweight aggregate making up the balance. Construction aggregate produced in the Las Vegas area in 2005, estimated to be 31 Mt, was about 15% higher than in 2004. Las Vegas has issued more new home construction permits per 1,000 nonfarming jobs than in any other metropolitan area in the country. The substantial increase in new home construction in recent years, along with attendant infrastructure construction and tourist destination building, has maintained local demand for construction aggregate at high levels for many years.

Sand and gravel operations accounted for more than 70% of the aggregate used in the Las Vegas metropolitan area in 2005, with crushed stone and lightweight aggregate making up the balance. The most important source of sand and gravel aggregate for Las Vegas is the Lone Mountain area northwest of Las Vegas, which accounted for more than 9 Mt in 2005. Significant production also comes from sand and gravel pits and stone quarries south and northeast of Las Vegas, and in the El Dorado Valley area southeast of Henderson. Since the mid-1990s, portable crushers that produce aggregate from sand and gravel at construction sites have been important producers of base aggregate in Las Vegas.

Companies in the Las Vegas area that produced more than 0.9 Mt (1 million short tons) of aggregate in 2005 were Aggregate Industries, American Sand and Gravel LLC, Las Vegas Paving Corp., Nevada Ready Mix Corp., and Rinker Materials Corp. Companies with production in excess of 454,000 metric tons per year (t/yr) were Granite Construction Inc. and Hollywood Sand and Gravel Co. Nevada Ready Mix Corp. mined all of its aggregate from alluvium in the Lone Mountain area. Minor production came from adjacent bedrock. Las Vegas Paving mostly produced sand and gravel from its Blue Diamond and Lone Mountain pits. The company also produced crushed stone from the Apex landfill about 16 km (10 miles) northeast of Las Vegas. Rinker Materials produced crushed granite from the El Dorado pit near Railroad Pass. Aggregate Industries Management Inc. mined and crushed limestone from Sloan a few miles south of Las Vegas. Community pits and other aggregate mining facilities administered by BLM and operated by several companies contributed more than 6.35 Mt to the Las Vegas area total in 2005. American Sand and Gravel LLC mostly produced aggregate from a community pit in the Lone Mountain area. The Southern Nevada Lightweight operation near the community of Jean produced aggregate for lightweight concrete block and sand for use in stucco. Lightweight aggregate was also shipped into the Las Vegas market by the Cind-R-Lite Block Co. from a cinder operation near Amargosa Valley in Nye County.

Production of construction aggregate in the Reno-Sparks-Carson City area, at about 7.3 Mt, was about 10% higher than in 2004. Companies in the area that produced more than 0.9 Mt of aggregate were Granite Construction Co., Martin Marietta Materials Inc., and RMC Nevada Inc. Granite Construction produced aggregate from several pits in the area, but the bulk of the company's production was crushed andesite and crushed granitic rock from its Lockwood and Hidden Canyon pits, respectively. Most of Martin Marietta's production comes from the Rocky Ridge Quarry north of Sparks, which produces crushed granitic rock. Rilite, Frehner Construction, and A & K Earthmovers, Inc. were also important producers. Crushed rock accounted for about 60% of the aggregate used in 2005 in the Reno-Sparks-Carson City area. Lightweight aggregate, an important component of crushed rock production in the area, was produced by Basalite Concrete Products LLC, Rilite Corp., and RMC Nevada.

Aggregate that was produced outside of the major metropolitan areas in 2005 was estimated to be about 3.6 Mt. Operators in Nye County together produced more than 454,000 t of aggregate in 2005, mostly in the Pahrump area. Churchill, Elko, Lincoln, and Lyon Counties each produced more than 181,000 t of aggregate. Douglas and Humboldt Counties each produced more than 90,700 t (1 million short tons) of aggregate. Other rural Nevada counties are estimated to have produced less than 90,700 t of aggregate each in 2005.

Barite.—Nevada produced nearly all the barite mined in the United States. About 95% of the barite sold domestically was

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used as a weighting agent in oil-and-gas-well drilling fluids. Nevada barite production slipped from 508,000 t in 2004 to 464,000 t in 2005. Nevada barite is mostly sold in the western United States and Canadian markets.

M-I Swaco was the leading Nevada barite producer in 2005, with combined production of about 249,000 t of screened and crushed high-grade ore from the Greystone Mine and ground and bagged barite from its Battle Mountain plant, both in Lander County. Baroid Drilling Fluids (a subsidiary of Halliburton Co.) was the second leading producer in Nevada, shipping 153,000 t. The company mined barite from the Rossi Mine in Elko County and processed it at the Dunphy Mill in Eureka County. Baker Hughes INTEQ shipped 61,700 t of barite from its Argenta operation near Battle Mountain in Lander County. Standard Industrial Minerals shipped a small amount of barite from a deposit of white, paint-grade barite at the P and S Mine in Nye County to a processing plant in Bishop, CA.

Nevada barite mining is now a shadow of its former self of the late 1970s and early 1980s, when as much as 2.18 million metric tons per year (Mt/yr) was produced by 25 or more producers. Since then, increased usage of imported Chinese barite, particularly in the Gulf Coast, sent Nevada production into decline. However, recent increases in domestic demand for barite may spur domestic exploration for the commodity.

Borate.—American Borate Co. processed colemanite from stockpile at the Lathrop Wells mill in Nye County. The colemanite was mined from the Billie Mine in Death Valley, CA, which is now shut down. The Nevada plant has a 20,000 t/yr capacity (B2O3 basis), but its production was not included in the estimate of total value of Nevada minerals because the ore is from out of State.

Cement.—The only major Nevada producer, the Nevada Cement Co. in Fernley, Lyon County, had production of about 540,000 t/yr of cement. The cement was manufactured from Tertiary-age lacustrine limestone mined a few miles south of Fernley, and other ingredients came from northern Nevada. The deposit near Fernley has limited reserves. Nevada Cement was evaluating a limestone deposit in the Natchez Pass Formation in the Humboldt Range of Pershing County. The limestone may be used as raw material in a proposed new cement plant on mill site claims located near the Rye Patch exit on Interstate 80.

Clay and Shale.—Nevada clay production was estimated to be 31,000 t in 2005, slightly less than in 2004 (Castor, 2005§). This does not include halloysite clay mined in Washoe County for Nevada Cement (which is included in the cement figure).

IMV Nevada produced more than 27,000 t of bentonite, saponite, and sepiolite from deposits in lacustrine sediments in the Ash Meadows-Amargosa Flat area of Nye County (Castor, 2005§). The clay occurs in shallow, flat-lying deposits in Pliocene-age lacustrine rocks. It was processed at a plant in Amargosa Valley and the clay products are exported worldwide. The saponite and sepiolite deposits are unusual and are considered to have originated in a Pliocene-age playa with an area of at least 57 square kilometers (22 square miles). The sepiolite, which yields most of the profits for the operation, occurs in an almost continuous bed with an average thickness of about 2 mm (7 feet).

Diatomite.—The international diatomite industry changed significantly in recent years. Filter aid markets continue to grow, demand for diatomite fillers decreased, and major producers changed ownership. In addition, concerns over health and safety issues associated with the crystalline silica in calcined diatomite have resulted in substitution of talc or calcium carbonate for diatomite fillers.

Nevada accounted for more than 30% of domestic diatomite production. About two-thirds of the diatomite produced in Nevada is used in filtration, with the remainder largely used in absorbents, fillers, and cement. Emerging small-scale uses include pharmaceutical processing and nontoxic insecticides.

Eagle-Picher Minerals, Inc. produces most of Nevada's diatomite at three different locations. The company's Colado operation in Pershing County is the most productive. It consists of a plant at Lovelock that mostly makes filtration product. The company also produces diatomite used in fillers and absorbents at its Clark plant and mine in Storey County, and diatomite is used in insulation from a pit near Hazen in Lyon County.

The Celite Corp. operates a mine at Hazen, with a plant in Fernley, which produces diatomite fillers. Moltan Co. of Tennessee ships absorbent products, cat litter, and soil conditioner under several labels from a mine and plant complex in Lyon County, also in Fernley. The Moltan diatomite resource is large, reportedly containing 100 years of reserves. The Grefco diatomite operation near the Esmeralda/Mineral County line is small relative to other Nevada diatomite producers. American Diatomite Inc. holds claims in the Esmeralda County in the vicinity of the Shu Fly diatomite deposit.

Dimension Stone.—Nevada is not typically well known as a producer of dimension stone. High-quality cut and polished products are not currently produced from stone mined in the State. Split dimension stone products are produced at two localities in Nevada. Oversize stone blocks are sold for use in wall construction, and new dimension stone operations are being evaluated.

Las Vegas Rock produced ashlar, boulders, crushed landscape rock, and flagstone from its Rainbow Quarries near Goodsprings. The stone is quartz-cemented sandstone that is part of the Jurassic-age Aztec Sandstone, which crops out extensively in Clark County, but is generally too friable for building stone.

Gemstones.—Precious opal was produced from the several mines in the Virgin Valley area of Humboldt County. The best known are the Bonanza, Hidden Valley, Rainbow Ridge, and Royal Peacock Mines. Virgin Valley is a well-known source of gemstones in North America. Much of the opal comes from pay-to-dig operations and was unreported. In addition, Nevada had recorded production of turquoise from the early years of the 20th century and probably has produced more than $30 million worth of the gemstone. In 2005, minor amounts of turquoise were produced from the Blue Ridge Mine in the Bullion District of Lander County.

Gypsum.—In 2005, gypsum production in Nevada was an estimated 1.6 Mt, about 15% less than in 2004. One of the State's largest producers stopped mining in 2005. The two largest Nevada producers, PABCO Gypsum and USG Corp. utilize most of the gypsum mined in Nevada in wallboard plants adjacent to mining operations.

PABCO Gypsum in Clark County mined and processed about 1.5 Mt of gypsum ore in 2005. Although processing yields only

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about 70% by weight gypsum from the ore, the company still ranks as the largest producer in Nevada. The gypsum, which is in a nearly flat-lying late Miocene-age gypsite blanket in excess of 36 m (120 feet) thick in places, occurs atop a 13-square-kilometer (5-square-mile) mesa.

USG, the nation's leading wallboard producer, was the second leading Nevada producer in 2005, at about 331,000 t. The company mined gypsum in western Pershing County and processed it into wallboard and plaster at a plant at Empire in Washoe County. The gypsum is of the Triassic or Jurassic age and forms several masses in a 2-square-mile area. The largest mass, the Selenite orebody, contains 85% to 95% gypsum.

The Art Wilson Co. of Carson City shipped anhydrite and gypsum from the Adams Mine in Lyon County. The Adams deposit is associated with limestone in Triassic-age metavolcanic rocks. The D.L. Denman Construction Company mined gypsum at the Pioneer Mine about 16 km (10 miles) east of Las Vegas. Material from these relatively small operations was used in agricultural and cement applications. The Pioneer Mine exploits the same late Miocene-age gypsite deposit as PABCO.

The gypsum mining operation of BPB PLC at Blue Diamond in Clark County was shut down in 2004. The gypsum deposit, which still contained reserves, consisted of nearly pure Permian-age gypsum as much as 9 m (30 feet) thick. The Blue Diamond area has been the site of gypsum mining since 1925 but is now in the path of metropolitan growth, and the former mine site is slated to become an upscale housing development. The adjacent Blue Diamond plant continued to produce wallboard in 2005, using gypsum imported from northern Arizona.

Lime, Limestone, and Dolomite.—In 2005, Nevada produced more than 1 Mt of lime. Limestone was mined for lime production at two sites in Nevada that are nearly at opposite ends of the State, but the high-calcium limestone that was utilized at both sites was from the same Devonian-age limestone unit. In addition to lime, relatively minor amounts of crushed limestone were also shipped from both sites, and dolomite is mined at one of the sites.

Graymont Western US, Inc. operated the Pilot Peak plant's high-calcium lime operation in Elko County. It was Nevada's largest producer, mainly marketing lime to gold mining operations for use in cyanide solution pH control. The Pilot Peak plant had three kilns with a combined capacity of more than 635,000 t/yr of quicklime per year and a hydrated lime plant capable of producing 318 metric tons per day (350 short tons per day).

Chemical Lime Co. produced lime at Apex in Clark County. The operation made high-calcium quicklime used in metallurgical processing, paper manufacturing, and environmental markets. The company also produced dolomitic lime and hydrated high calcium lime at Apex, mainly for construction uses. The company's Henderson plant processed Type S lime for building and home construction.

In addition to lime, Graymont Western U.S. and Chemical Lime shipped crushed limestone. Other carbonate rock producers were Min-Ad, Inc. and Nutritional Additives Corp., producers of agricultural and nutritional dolomite products near Winnemucca in Humboldt County. Columbus S.M. LLC, a small California-based company, was evaluating the production of calcium carbonate and magnesium hydroxide from the Columbus Salt Marsh in Esmeralda County.

Lithium.—Nevada was the only State with domestic production of lithium raw materials. Chemetall Foote Corp. produced lithium carbonate, lithium hydroxide anhydrite, and lithium hydroxide monohydrate at Silver Peak in Esmeralda County. The lithium chemicals were produced by solar evaporation/preconcentration and subsequent refining techniques from brine that was pumped from beneath the Clayton Valley playa. In 2005, U.S. lithium imports increased more than 200% and exports have fallen by more than 20% since 1997.

Magnesia.—Magnesium minerals have been mined at Gabbs Valley in Nye County since 1935. In the 1940s, magnesia was processed in Henderson, NV, to make magnesium metal. From the 1950s to the 1980s, mining and processing were performed by Basic Industries, a major producer of refractory magnesia. Currently, Premier Chemicals LLC owns the magnesia operation in Gabbs Valley. During the 1990s, the availability of cheap foreign refractory magnesia caused production to be switched to light-burned (caustic) magnesia that is mainly marketed for wastewater treatment and agricultural uses. Although production of magnesia was still substantially below its peak in 1981, magnesia shipments from the Gabbs Valley operation increased steadily between 1996 and 2004. Production in 2005 was about the same as in 2004.

About 60% of U.S. magnesia production comes from seawater and natural brines, and the mine at Gabbs Valley was the only location in the country where magnesite and brucite are mined. The brucite, which was shipped in relatively small amounts from the Gabbs operation, was now mainly mined from pods adjacent to igneous rocks in magnesite pits. Magnesite and brucite at Gabbs occur in Triassic-age dolomite. The resource is thought to be well in excess of 50 years at present mining rates.

Perlite.—Nevada has large perlite resources and several deposits of perlite that have been mined extensively. The State in recent years has produced only minor amounts of perlite. In 2005, perlite production in Nevada was restricted to relatively small-scale mining of two deposits for niche markets. Wilkin Mining and Trucking Inc. mined perlite from the Tenacity Perlite Mine in Lincoln County. The company has been mining perlite in the area for more than 25 years. In the past, most of the perlite was shipped as crude. The company owned a small popping plant, the Tenacity Perlite Mill, in Caliente. Sales were almost exclusively of expanded perlite that is mainly used for horticultural purposes. In 2005, the company shipped about 1,500 t of expanded perlite.

Eagle-Picher Minerals Inc. produced expanded perlite at its Colado diatomite plant in Pershing County from perlite mined at the Popcorn Mine in Churchill County. The perlite is marketed as a filter aid, and plant capacity is about 7,300 t/yr.

Potassium Alum.—A small amount of potassium alum (kalinite) was shipped by Rulco from a deposit in Esmeralda County near Silver Peak. The kalinite is being marketed for horticultural use.

Salt.—The Huck Salt Co. produced more than 27,000 t of salt in 2005, up more than 100% during the 2004 production. The salt is mainly used for deicing roads, and production levels are dependent on weather. The 2005 increase was probably owing to depleted road salt stockpiles following a series of heavy snow

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storms in northern Nevada in the winter of 2004-05. The salt is mined from a playa in Fourmile Flat in Fallabout located in Churchill County.

Silica.—Nevada's major silica producer, Simplot Silica Products at Overton in Clark County, shipped about 680,000 t of silica sand in 2005, about the same as in 2004. The sand was mined from a large open pit in the relatively friable Cretaceous-age sandstone, washed in the pit, and transported via an 8-km (5-mile) slurry pipeline to a plant where it is screened and bagged. Silica sand has been produced from the deposit since the 1930s. Simplot acquired the operation in 1955. The company planned to upgrade its processing facilities in the near future, with a view toward increasing production from levels in 2005 to as much as 771,000 t/yr.

American Cement and Aggregate produced silica sand from the Ordovician-age quartzite about 5 km (3 miles) southeast of Mercury in Nye County. A plan of operations submitted to the BLM in 2001 called for production of as much as 72,600 t/yr. The product, which contains about 98% SiO2, is mainly used as construction sand. The company also held claims that cover an abandoned quarry in Eureka Quartzite that contained more than 99% SiO2 in Clark County.

Mt. Moriah Stone quarried flaggy, light-gray quartzite from the Cambrian-age Prospect Mountain Quartzite at a quarry in White Pine County. This material, which naturally splits into large slabs, is used for flagstone and other types of uncut building stone.

Zeolites.—Nevada contains large identified resources of zeolite. Production has been small, and no zeolite is currently mined in Nevada. Ash Meadows Zeolite LLC ships 907 to 4,540 t/yr of clinoptilolite used in water filtration, odor control, and nuclear cleanup from a plant in Amargosa Valley in Nye County (Castor, 2005§). The clinoptilolite was mined, however, from a small open pit in California that is in a large area of zeolite deposits that extends into Nevada.

Metals

As reported by the NBMG and the NDM, Nevada produced more than 213,000 kg (6.85 million troy ounces) of gold, 309,000 kg (9.95 million troy ounces) of silver, 57,000 t (126 million pounds) of copper, and 109,000 kg (0.24 million pounds) of mercury in 2005. Although gold production was down 2,240 kg (72,000 troy ounces) from that of 2004, Nevada by far maintained its place as the leading producer of gold in the United States, being in excess of 15 times greater than that of the next highest producing State, and more than 6 times that of the combined total of the second through fourth highest producing States. There were 28 mines in Nevada that reported gold production to the NDM in 2005; mercury production was entirely a byproduct of gold-silver processing. Although Coeur d'Alene Mines Corp.'s Rochester Mine remained the leading (primary) silver mine in the United States where silver is the principal product, mining at that operation was planned to end in 2007. In 2005, copper production, encouraged by record-high prices for the year, was up 370%, entirely because of ramping up of production from Quadra Mining Ltd.'s Robinson copper-gold-silver mine near Ely in White Pine County (Muntean, 2006, p. 13).

Gold.—Nevada's production of gold, valued at more than $3.0 billion, was largely responsible for the United States being the third leading gold producer in the world in 2005; the State alone accounted for 9% of world production of gold. Only the countries of Australia, China, and South Africa produced more gold than Nevada in 2005. Like the northernmost sector of the Republic of South Africa, the "Transvaal," the most productive region of the Republic of South Africa, Nevada is a world leader in terms of gold production per unit area. From the State's mines, 745 t of gold was produced per million square kilometers. (The "Transvaal" Province of the Republic of South Africa was officially restructured into four separate provinces starting in 1994 but still is a commonly used geographical descriptive term.)

Production of gold came from 24 major mining operations in 2005. The Carlin trend in northeastern Nevada accounted for 50% of the total production. Eight additional mining operations, not on the Carlin trend, each produced more than 3,110 kg (100,000 troy ounces) of gold from mostly multimillion-ounce deposits. In large part because of Nevada's production, the United States has been a net exporter of gold, most of which is sold on the international market for jewelry and arts and some of which is sold for its conductive and noncorrosive qualities in computers and other electronics and for use in dental work.

Barrick Gold Corp., with production from its Betze-Post, Meikle, and Ruby Hill Mines, its 50% share of the Round Mountain Mine (50-50 joint venture with Echo Bay Mines Ltd.), and its 33% share of the Marigold Mine (joint venture with Glamis Marigold Mining Co.) produced a total of about 76,600 kg (more than 2,460,000 troy ounces) of gold and quantitatively was the leading producer on the Carlin trend and statewide. For the sixth consecutive year, Barrick's Betze-Post Mine in Eureka County was Nevada's most productive gold mine, with an output of 47,100 kg (more than1.51 million troy ounces). Barrick's Meikle Mine, the largest underground mine in Nevada, produced more than 15,800 kg (nearly 510,000 troy ounces) of gold (Muntean, 2006, p. 13).

Newmont Mining Corp. was Nevada's second leading gold producer with production as reported from the company's Carlin trend mines—the Capstone/Bootstrap, Midas, and Rain Mines—Newmont's Mule Canyon Mine on the Battle Mountain-Eureka trend (BME), its Phoenix Mine (just south of BME), and on the Getchel trend, the Lone Tree Mine, the Turquoise Ridge joint venture (Newmont—25% share) with Placer Dome Inc., and the Twin Creeks Mine; combined together Newmont had a total Nevada production of nearly 71,200 kg (nearly 2.29 million troy ounces). Newmont's Carlin trend mines alone produced nearly 43,500 kg (nearly 1.4 million troy ounces) of gold, whereas the operations at the Cortez Joint Venture [Placer Dome (60%) and Kennecott (40%)] produced 28,500 kg (916,000 troy ounces) of gold from the Pipeline open pit. Placer Dome Inc., which was acquired by Barrick Gold in early 2006, produced 24,400 kg (nearly 784,000 troy ounces) in 2005 (Muntean, 2006, p. 13; Price and Meeuwig, 2006, p. 8).

Nevada and the United States as a whole have produced a significant portion of the world's gold production. The USGS estimates that total world gold production, since the beginning of civilization, has been 152,000 t (4.9 billion troy ounces).

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About 85% of that gold is still in use (in bullion, coins, jewelry, electronics, etc.), and most gold currently being mined is recycled (George, 2007). Through 2005, cumulative gold production in Nevada (beginning with the Comstock lode in 1859) stood at 5,080 t (slightly more than 163 million troy ounces). Approximately 85% of this Nevada total, or 4,320 t (nearly 139 million troy ounces), has been produced since the Carlin Mine began production in 1965; 82% of this same total, or 4,170 t (134 million troy ounces), has been produced during the current period of substantial increase, from 1981 through 2005; and 49% of this total, 2,490 t (80 million troy ounces) has been produced in the decade from 1996 to 2005. Total U.S. production, primarily since 1835, is approximately 16,000 t (514 million troy ounces) or nearly 11% of total world gold production, and total Nevada production is about 3% of total world production and about 31% of total U.S. production. The Carlin trend alone accounts for slightly more than 1% of all the gold ever mined in the world (Price and Meeuwig, 2006. p. 6). By yearend 2005, cumulative production from the Carlin trend reached 1,940 t of gold (62.4 million troy ounces), keeping its place as one of the most productive gold-mining districts in the world.

Silver.—Coeur d'Alene's Rochester Mine maintained its place as the leading silver mine in Nevada with a production of about 178,000 kg (more than 5.72 million troy ounces) of silver. Newmont's Midas Mine was rank second with production of 67,400 kg (nearly 2.17 million troy ounces) of silver, followed by Round Mountain Mine in third place with 19,800 kg (more than 636,000 troy ounces) of silver (Muntean, 2006, p. 13).

Much of Nevada's silver production in 2005 was a coproduct or byproduct of gold mining. With a ratio of value (average price of gold to average price of silver) of 61:1 in 2005, only those deposits with more than 61 times as much silver as gold were considered primary silver deposits. Only one such deposit operated in Nevada in 2005—the Coeur Rochester Mine in Pershing County (with a silver to gold production ratio of 81:1). This one mine produced nearly 58% of Nevada's silver in 2005. Nevada's production accounted for 25% of the U.S. total and 1.5% of the world total. Although the Coeur Rochester Mine is approaching closure and production in Alaska now makes that State the leading silver producer in the country because of substantial byproduct silver production, Nevada continued to be referred to by its historic nickname, the "Silver State," by many mining and State government interests, on the basis of both historical and present-day production (Price and Meeuwig, 2006, p. 10).

Environmental Issues and Mine Reclamation Awards

The Nevada Excellence in Mine Reclamation Awards were presented to three mining companies for their accomplishments in restoring and preserving Nevada's environment at the annual Nevada Mining Association Convention, held September 8, 9, and 10, 2005. Rosebud Mining Co. received the Overall Mine Reclamation Award for their reclamation success at the Rosebud Mine in Pershing County. The Rosebud Mine was a joint venture between Hecla Mining Co. and Newmont Mining Corp., with Hecla as the operator. The underground mine operated from 1997 to 2000. Owing to its impressive work in concurrent reclamation, wildlife habitat enhancement, recontouring and revegetation, and closure plan development and implementation, Rosebud Mining Co. was awarded the Overall Mine Reclamation Award (Driesner and Coyner, 2005§).

Turquoise Ridge Joint Venture was given an award in the category of Innovation in Reclamation Techniques for their work at their Turquoise Ridge Mine in Humboldt County. The Turquoise Ridge Mine was a joint venture between Placer Dome and Newmont Mining Corp., with Placer Dome as the operator. The companies' novel approach to the reclamation and closure of the TRJV Heap Leach Facility addressed several challenging geochemical conditions and eliminated all post-closure discharge from the facility. The original and innovative evaporative cell design incorporated into the TRJV Heap Leach Facility has been copied and used at other mine closure sites in Nevada.

Cortez Gold Mines was honored in the area of Wildlife Habitat Enhancement for their efforts at the Pipeline Mine in Lander County. The Pipeline Mine was a joint venture between Placer Dome and Kennecott Minerals, with Placer Dome as the operator. The unique design and revegetation of the waste rock disposal areas at the Pipeline Mine has created an extremely wildlife friendly site. Additionally, the use of variable topography and native seed mixes has allowed wildlife to rapidly repopulate the mine area. The waste rock disposal areas at the Pipeline Mine were an excellent example of proactive concurrent mine reclamation and successful post-mining land use for enhanced wildlife habitat. "Many of the projects receiving the Nevada Excellence in Mine Reclamation Award are unique in the United States, if not the world," as stated by the Administrator of the NDM. "Nevada's mining industry should be commended for leading the way in successful reclamation and environmental protection."

The Nevada Excellence in Mine Reclamation Awards are given cooperatively by the Nevada Division of Minerals, Nevada Division of Environmental Protection, Nevada Division of Wildlife, BLM, and the U.S. Forest Service. There have been 50 projects and 6 individuals recognized since the awards program began in 1990.

Government Programs

Through a survey conducted early in 2006, the Nevada Division of Minerals collected data for Nevada Bureau of Mines and Geology Special Publication P-15, Major Mines of Nevada 2005. This publication includes, in handbook form, location maps, names and telephone numbers of operators, numbers of employees, and nonproprietary production figures for most mines in Nevada. It also contains a section on economic impacts of the industry. The full contents of this 28-page publication and the NBMG annual report, currently The Nevada Mineral Industry 2005, were produced in print in limited quantity but also are available for free on the Internet at URL www.nbmg.unr.edu.

Additional information about the Nevada mineral industry and the U.S. gold industry, including the contents of selected publications, is readily available online through the Nevada Bureau of Mines and Geology Web site at URL www.nbmg.unr.edu/ and the Nevada Division of Minerals Web site at URL

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http://minerals.state.nv.us/. Useful national and international data on nonfuel minerals can be obtained from the USGS Web site at URL http://minerals.usgs.gov/minerals/ and the U.S. Energy Information Administration Web site at URL http://www.eia.doe.gov/, which provides data on oil and gas, geothermal, and other energy sources. The Geological Society of Nevada (information accessible at URL www.gsnv.org) held its semidecadal symposium in May 2005; approximately 90 reviewed papers were published in a bound volume.

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TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN NEVADA[1, 2]

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral		2003 Quantity	2003 Value	2004 Quantity	2004 Value	2005 Quantity	2005 Value
Clays:							
Bentonite		6	817	7	W	7	W
Fuller's earth		28	3,870	W	W	W	W
Gold[3]	kilograms	227,000	2,660,000	216,000	2,850,000	212,000	3,030,000
Sand and gravel, construction		37,100	174,000	43,100	197,000	52,300	230,000
Silver[3]	kilograms	322,000	50,900	302,000	65,000	276,000	65,200
Stone, crushed		7,830	48,500	9,760	72,800	9,320	66,800
Combined values of barite, brucite (2003-04), cement (portland), clays (kaolin), copper (2004-05), diatomite, gemstones, gypsum (crude), lime, lithium carbonate, magnesite, perlite (crude), salt, sand and gravel (industrial), zeolites (2004-05), and values indicated by symbol W		XX	252,000	XX	286,000	XX	488,000
Total		XX	3,190,000	XX	3,470,000	XX	3,880,000

W Withheld to avoid disclosing company proprietary data. Withheld values included in "Combined values" data. XX Not applicable.
[1]Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2]Data are rounded to no more than three significant digits; may not add to totals shown.
[3]Recoverable content of ores, etc.

TABLE 2
NEVADA: CRUSHED STONE SOLD OR USED, BY KIND[1]

Kind	2004 Number of quarries	2004 Quantity (thousand metric tons)	2004 Value (thousands)	2005 Number of quarries	2005 Quantity (thousand metric tons)	2005 Value (thousands)
Limestone	5	4,330	$29,900	6	4,710	$26,700
Dolomite	3	W	W	3	W	W
Granite	3	W	W	3	W	W
Volcanic cinder and scoria	2	W	W	2	W	W
Miscellaneous stone	3	968	9,200	3	1,060	6,580
Total	XX	9,760	72,800	XX	9,320	66,800

W Withheld to avoid disclosing company proprietary data; included in "Total." XX Not applicable.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.

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TABLE 3
NEVADA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2005, BY USE[1]

(Thousand metric tons and thousand dollars)

Use	Quantity	Value
Construction:		
Coarse aggregate, graded, concrete aggregate (coarse)	W	W
Fine aggregte (-⅜ inch):		
Stone sand, concrete	W	W
Other fine aggregate	W	W
Coarse and fine aggregates:	W	W
Graded road base or subbase	W	W
Other coarse and fine aggregates	W	W
Other construction materials	2	13
Agricultural, other agricultural uses	W	W
Chemical and metallurgical:		
Cement manufacture	W	W
Lime manufacture	W	W
Chemical stone	W	W
Sulfur oxide removal	W	W
Special, mine dusting or acid water treatment	W	W
Unspecified[2]		
Reported	2,620	16,400
Estimated	2,900	18,000
Total	5,520	34,700
Grand total	9,320	66,800

W Withheld to avoid disclosing company proprietary data; included in "Grand total."
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Reported and estimated production without a breakdown by end use.

TABLE 4
NEVADA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2005, BY USE AND BY DISTRICT[1]

(Thousand metric tons and thousand dollars)

	District 1		District 2	
Use	Quantity	Value	Quantity	Value
Construction:				
Coarse aggregate graded[2]	--	--	W	W
Fine aggregate (-⅜ inch)[3]	--	--	W	W
Coarse and fine aggregates[4]	W	W	W	W
Other construction materials	--	--	2	13
Agricultural[5]	W	W	--	--
Chemical and metallurgical[6]	W	W	W	W
Special[7]	--	--	W	W
Unspecified:[8]				
Reported	1,840	11,500	777	4,880
Estimated	1,100	7,200	1,800	11,000
Total	3,950	33,100	5,380	33,700

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes concrete aggregate (coarse).
[3]Includes stone sand (concrete) and other fine aggregate.
[4]Includes graded road bases or subbase and other coarse and fine aggregates.
[5]Includes other agricultural uses.
[6]Includes cement and lime manufacture, chemical stone, and sulfur oxide removal.
[7]Includes mine dusting or acid water treatment.
[8]Reported and estimated production without a break down by end use.

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TABLE 5
NEVADA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2005, BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete products (blocks, bricks, pipe, decorative, etc.)	3,290	$24,100	$7.33
Plaster and gunite sands	582	4,080	7.01
Asphaltic concrete aggregates and other bituminous mixtures	1,300	8,800	6.78
Road base and coverings[2]	8,080	32,100	3.97
Fill	1,680	5,600	3.35
Snow and ice control	58	298	5.14
Other miscellaneous uses[3]	2,120	9,610	4.53
Unspecified:[4]			
Reported	18,300	60,700	3.32
Estimated	16,900	85,100	5.04
Total or average	52,300	230,000	4.41

[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes road and other stabilization (cement).
[3]Includes filtration.
[4]Reported and estimated production without a breakdown by end use.

TABLE 6
NEVADA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2005, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		Unspecified districts	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregates (including concrete sand)[2]	1,010	8,260	2,870	19,900	--	--
Asphaltic concrete aggregates and other bituminous mixtures	358	3,230	891	5,200	49	367
Road base and coverings[3]	1,920	10,500	6,070	21,100	95	481
Fill	1,140	3,940	534	1,660	--	--
Other miscellaneous uses[4]	776	2,810	1,410	7,100	--	--
Unspecified:[5]						
Reported	1,800	9,990	5,530	29,600	11,000	21,100
Estimated	2,100	10,500	14,800	74,600	--	--
Total	9,070	49,300	32,100	159,000	11,100	22,000

-- Zero.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes plaster and gunite sands.
[3]Includes road and other stabilization (cement).
[4]Includes filtration and snow and ice control.
[5]Reported and estimated production without a breakdown by end use.

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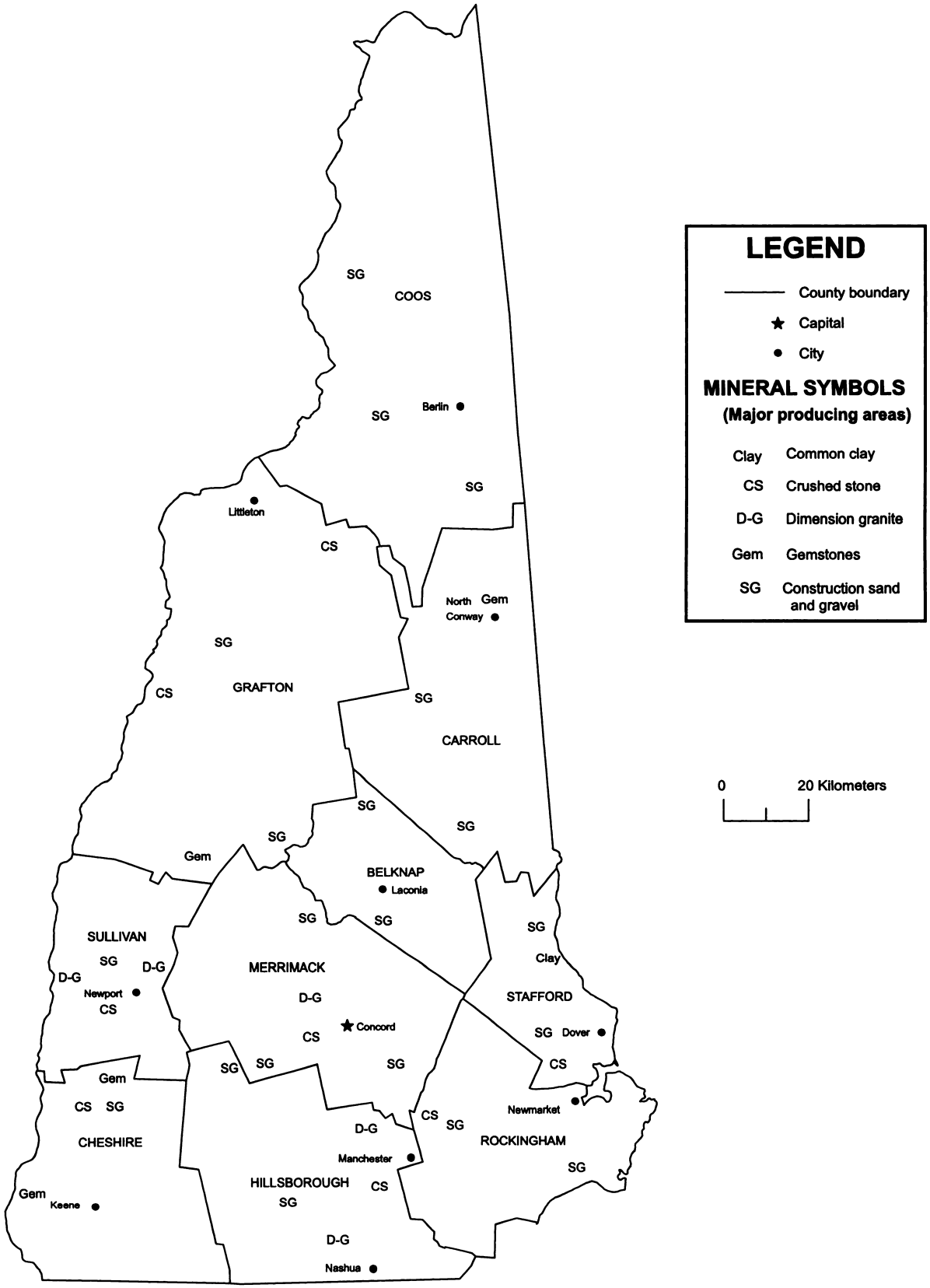
NEW HAMPSHIRE



Source: New Hampshire Geological Survey/U.S. Geological Survey (2005)

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THE MINERAL INDUSTRY OF NEW HAMPSHIRE

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the New Hampshire Geological Survey for collecting information on all nonfuel minerals.

In 2005, New Hampshire's nonfuel raw mineral production was valued[1] at $88.2 million, based upon annual U.S. Geological Survey (USGS) data. This was a 25% increase from the State's total value of $70.5 million of 2004, which followed a 13% increase from 2003 to 2004. Because data for dimension granite have been withheld (company proprietary data), the State's actual total nonfuel mineral values for 2003-05 are higher than those reported in table 1.

Construction sand and gravel, a high-volume, low-unit-value mineral commodity, remained New Hampshire's leading nonfuel mineral commodity in 2005, accounting for nearly 54% of its nonfuel raw mineral production value. A $17 million increase in the value of crushed stone, the State's second leading nonfuel mineral, accounted for most of the State's rise in value in 2005; crushed stone production was up by 8%. Smaller increases also took place, in descending order of change, in the values of construction sand and gravel and dimension stone; gemstones value remained unchanged (table 1).

New Hampshire continued to produce significant quantities of dimension stone in 2005, with a more than a 30% increase in production, rising to 13th from 15th among 35 dimension stone-producing States.

The following narrative information was provided by the New Hampshire Geological Survey[2] (NHGS).

Exploration

Exploration for economic deposits of construction sand and gravel and crushed stone continued in 2005. The public continued to maintain a small but steady interest in panning for gold in northern New Hampshire.

Commodity Review

Industrial Minerals

Common Clays.—The State has extensive resources of marine clays, some of which were produced as the demand arose from local resources for use as borrow material for the base of landfills, as lining beds for ponds, and the core of dams. Some of the State's glacial tills, rich in silt and clay, were also used for these same purposes.

Construction Sand and Gravel.—In 2005, sand and gravel demand stabilized near 2004 levels, although actual applications for permits to open new pits increased to slightly more than the number of requests in 2004. A number of New Hampshire's smaller operations open and close on short notice, fluctuating with market demand. Public projects remained stable, while the private and commercial construction markets were slowed by rising interest rates. The State continues to have untapped sand and gravel resources, but opening new pits is often opposed by local residents, conflicting proposed uses for the location, and various ordinances. As the supply and access to the good sand and gravel deposits decreases, there is a continued shift toward rock-based aggregates. The NHGS continued to participate with researchers at the University of New Hampshire's Jackson Estuarine Laboratory in a cooperative project to compile data and map the subsea terrain off the New Hampshire coast to better understand the surficial geology, and in particular to map possible sand and gravel resources for potential beach replenishment.

Crushed Stone.—The crushed stone industry remained stable with an increase in production in 2005. Rock quarrying and crushing operations were able to supply the assortment of material sizes and blends needed for a wide range of uses. Demand for use in New Hampshire Department of Transportation projects continued at constant levels. The State's crushed stone is mainly used in the making of asphalt and concrete, as rip-rap and roadway subgrade material, for drainage, and in general construction products.

Some issues facing the industry included effects from the current state of the economy and of quarry operations on the surrounding communities. Demand by the private and commercial construction market was slowed by higher interest rates. Stone operations in the State dealt with pressure from residents as to quarry location and the effects of noise, dust, and heavy hauling. Opposition to expansion of these operations near populated areas continued to be somewhat problematic to the industry.

Dimension Stone.—The demand for New Hampshire's dimension granite for use as curbing and landscaping, continued strong in 2005, with the demand for curbing stone up from the previous year. The Swenson Granite Co. in Concord and the Massachusetts-based Fletcher Granite Co., with its quarry in Milford, NH, continued to be the State's major dimension stone producers. Both quarries cut the gray, two-mica Concord Granite, mostly for which New Hampshire got its nickname, the Granite State. Several other smaller, independent operations also quarried the Concord Granite, their production being used mostly for landscaping. A recently opened quarry in the western part of the State continued to expand, supplying granite gneiss used for building facing and architectural dimension stone.

Gemstones.—Mineral collecting from the State's many pegmatites continued to be active in 2005, with a few "good"

[1]The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2005 USGS mineral production data published in this chapter are those available as of December 2006. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—can be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

[2]Lee Wilder, Public Outreach Coordinator for the New Hampshire Geological Survey, authored the text of State mineral industry information provided by that agency.

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finds reported. On a commercial scale, the Wm. Weiss Mine in Westmoreland, north of Brattleboro in southern New Hampshire, was producing green, purple, and clear fluorite for fluorspar and decorative uses, and the Tripp Mine in Alstead in the southwestern corner of the State mined beryl, mostly for mineral specimens. In a recent blasting operation at the Ruggles Mine in Grafton in southern Grafton County, some aquamarine of significant quality was recovered.

Government Programs and Activities

As has become the case with many other States, New Hampshire has realized the need to protect existing and future water supplies from development. With the continued increase in rural housing and the commercial demands for bottling/processing water, the need for protecting ground water aquifers was beginning to reach critical proportions. Many of the State's best aquifers were underlain by housing or infrastructure, and these same aquifers were located in stream valleys, where it also was particularly easy to build. Demand continued for NHGS geologic mapping products for reliable aquifer information.

The NHGS continued expanding its ground water monitoring network to better serve as an indicator of regional hydrologic conditions. Bedrock wells were being drilled at strategic locations as companions to existing surficial monitoring wells. In addition to expanding the geographic coverage of the network, the NHGS hopes to gain a better understanding of the interaction between bedrock and surficial aquifers.

The NHGS continued to be active in the STATEMAP program, a component of the congressionally mandated National Cooperative Geological Mapping Program (NCGMP), which the USGS distributes Federal funds to support geologic mapping efforts through a competitive funding process. The NCGMP has three primary components: (1) FEDMAP, which funds Federal geologic mapping projects, (2) STATEMAP, which is a matching-funds grant program with State geological surveys, and (3) EDMAP, a matching-funds grant program with universities that has a goal to train the next generation of geologic mappers. In 2005, under the STATEMAP cooperative agreement, the surficial geology of the Milton quadrangle was mapped at the 1:24,000 scale and the bedrock geology of the Mount Washington West and East quadrangles was remapped also.

The NHGS continued answering public inquiries regarding the State's minerals, bedrock, surficial materials, ground water, and general geology. Geologic inquiries can be made by means of e-mail, geology@des.state.nh.us, as well as by telephone or personal visits. Outreach and education efforts included that of the staff working with State and local governments; participation in workshops, conferences, field days, and Earth Science Week; and classroom presentations and public lectures. The NHGS Lunchtime Lecture Series, which was open to the general public, increased in popularity. The lectures, held at the New Hampshire Department of Environmental Services and NHGS auditorium in Concord, were aimed at addressing areas of current geologic as well as minerals information interest.

The NHGS's publications on the New Hampshire's minerals, bedrock, surficial geology, and ground water resources can be obtained by contacting the Public Information Center of the Department of Environmental Services by way of the Internet at URL http://www.des.state.nh.us/geo1link.htm.

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN NEW HAMPSHIRE[1,2]

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral	2003		2004		2005	
	Quantity	Value	Quantity	Value	Quantity	Value
Gemstones	NA	6	NA	6	NA	6
Sand and gravel, construction	8,470	41,200	8,940	46,600	8,400	47,400
Stone:						
Crushed	4,110	21,400	4,720 r	23,900 r	5,100	40,900
Dimension, granite	W	(3)	W	(3)	W	(3)
Total	XX	62,500	XX	70,500 r	XX	88,200

rRevised. NA Not available. W Withheld to avoid disclosing company proprietary data. XX Not applicable.
[1]Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2]Data are rounded to no more than three significant digits; may not add to totals shown.
[3]Value excluded to avoid disclosing company proprietary data.

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TABLE 2
NEW HAMPSHIRE: CRUSHED STONE SOLD OR USED, BY KIND[1]

Kind	2004 Number of quarries	2004 Quantity (thousand metric tons)	2004 Value (thousands)	2005 Number of quarries	2005 Quantity (thousand metric tons)	2005 Value (thousands)
Granite	7	1,840	$8,750	7	2,080	$16,400
Traprock	7 r	2,880 r	15,100 r	7	3,020	24,400
Total	XX	4,720 r	23,900 r	XX	5,100	40,900

rRevised. XX Not applicable.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.

TABLE 3
NEW HAMPSHIRE: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2005, BY USE[1]

(Thousand metric tons and thousand dollars)

Use	Quantity	Value
Construction:		
Coarse aggregate (+1½ inch), riprap and jetty stone	W	W
Coarse aggregate graded, bituminous aggregate, coarse	W	W
Fine aggregate (-⅜ inch), stone sand, bituminous mix or seal	W	W
Unspecified:[2]		
Reported	3,320	26,300
Estimated	1,000	8,000
Total	5,100	40,900

W Withheld to avoid disclosing company proprietary data; included in "Total."
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Reported and estimated production without a breakdown by end use.

TABLE 4
NEW HAMPSHIRE: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2005, BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	379	$3,170	$8.35
Asphaltic concrete aggregates and other bituminous mixtures	348	2,940	8.45
Road base and coverings	677	4,200	6.20
Fill	659	2,300	3.50
Snow and ice control	96	647	6.74
Railroad ballast	20	208	10.40
Filtration	4	61	15.25
Unspecified:[2]			
Reported	2,370	12,600	5.32
Estimated	3,900	21,200	5.50
Total or average	8,400	47,400	5.64

[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.
[2]Reported and estimated production without a breakdown by end use.

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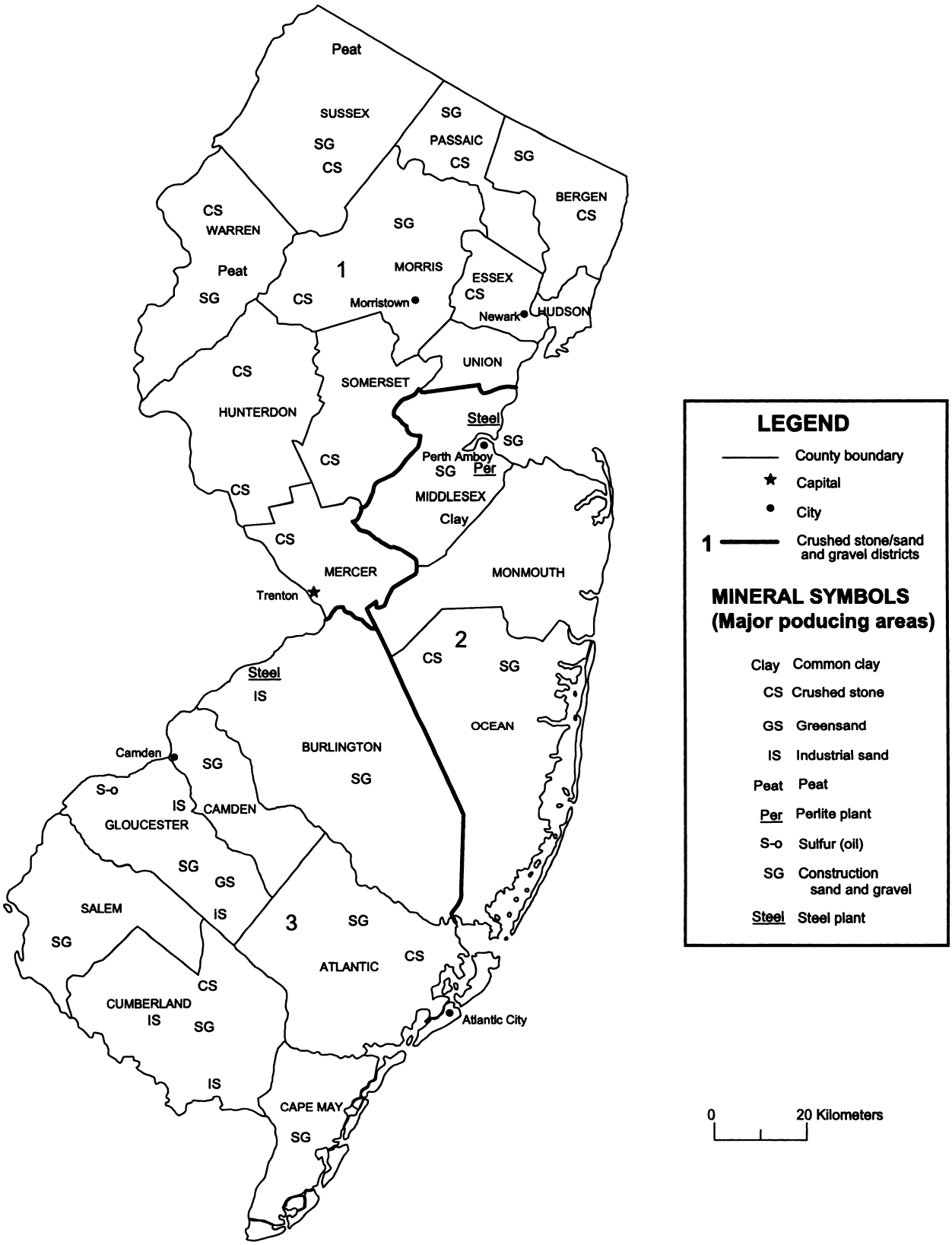
NEW JERSEY



Source: New Jersey Geological Survey/U.S. Geological Survey (2005)

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The Mineral Industry of New Jersey

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the New Jersey Geological Survey for collecting information on all nonfuel minerals.

In 2005, New Jersey's nonfuel raw mineral production was valued[1] at $344 million, based upon annual U.S. Geological Survey (USGS) data. This was a marginal decrease compared with that of 2004, which was up 7.5% from 2003. Crushed stone and construction sand and gravel, by value, were New Jersey's leading nonfuel mineral commodities, followed by industrial sand and gravel and greensand marl.

In 2005, a 5.4% increase in construction sand and gravel production resulted in a $25 million increase in the commodity's value, an increase in unit value of 15%. But this increase was slightly more than balanced out by decreases in the values of crushed stone and industrial sand and gravel. A 10.6% decrease in crushed stone production accounted for a $25 million decrease in its overall value; although this represented an only 3% decrease in unit value. In industrial sand and gravel, although a nearly 10% decrease in production resulted in a $1.7 million drop in its value, the commodity's unit value rose by 5.7%. Relatively small decreases also took place in the production and value of greensand marl (table 1).

New Jersey continued to be the only State to produce greensand marl and it decreased to fifth from fourth in the quantity of industrial sand produced. Greensand marl was used directly as an organic conditioner and fertilizer for soils and as a water filtration medium to remove soluble iron and manganese from well water. Additionally, the State's aggregate operations produced significant quantities of crushed stone and construction sand and gravel.

The following narrative information was provided by the New Jersey Geological Survey[2] (NJGS). Overall, the economy in the State eased slightly during the year. The demand for office space and the pace of housing construction dropped, and previously increasing and higher prices for raw materials leveled off owing to less demand for the State's construction mineral resources.

The number of operating surface mines (mainly crushed stone quarries and construction sand and gravel pits) remained steady. No new mining properties have opened during the past 20 or more years. However, some mineral extraction did take place at various construction sites around the State, but these were of short term duration and limited in scope. Also, no subsurface mining activity took place, nor was any anticipated in the foreseeable future.

[1]The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2005 USGS mineral production data published in this chapter are those available as of December 2006. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—can be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

[2]Lloyd Mullikin, Supervising Geologist, authored the text of the State mineral industry information provided by the New Jersey Geological Survey.

Commodity Review

Industrial Minerals

Construction Sand and Gravel.—Amboy Aggregates, the only sand and gravel dredging operation in the State's offshore waters, faced redevelopment pressure from the South Amboy City Council. The council approved a resolution allowing the city to begin acquiring 34 hectares (ha) of land along the Raritan Bay waterfront, of which Amboy Aggregates is one of five companies that are property owners. The city of South Amboy blighted the property, raising the possibility of it being taken by eminent domain. (A blighted property is one that is officially/legally declared rundown, has environmental problems, or is otherwise in "need of redevelopment.") At its port facility in South Amboy, the company unloads the sand that it mines in the nearby bay and processes it into fine aggregate that goes into concrete, asphalt products, and building products in general, for use in northern New Jersey, the five boroughs of New York, and the eastern shore of the State of Connecticut. In northern New Jersey, significantly more stone resources exist than do sand and gravel. The company, which employed 65 people, had been operating for the past 20 years, and prior to that, another 20 years under another owner. The company's current business is uniquely suited to this type of mining and its land operation, which economically and practicably needs to be nearby on the Bay, would be difficult to duplicate elsewhere (Journal Publications, Inc., 2005§[3]).

Only one active property changed hands in 2005. Clayton Companies of Lakewood in northern Ocean County purchased Loizeaux Building Supply Co., a producer of concrete products in Elizabeth in eastern Union County. Clayton Companies is New Jersey's leading sand and gravel and concrete producer, as well as, a major producer of concrete block in the State.

Government Programs and Activities

The New Jersey Department of Environmental Protection (NJDEP), through its "Green Acres" land preservation program, which began in 1961, obtained from the U.S. Silica Co. several parcels of property that previously had been mined or was surplus land adjacent to such property, in the Townships of Commercial, Downe, and Maurice River in Cumberland County. The program, under the umbrella of the NJDEP, also provides funding to local governments to develop parks. In May, through the Green Acres program, the NJDEP purchased the 91-ha Sahara Sand Mine property in Monroe Township, Gloucester County, for $1.2 million from Sahara Sand Co., a subsidiary of Silvi Group Companies. The purpose of the purchase was to potentially turn the property into a park for all-

[3]References that include a section mark (§) are included in the Internet References Cited section.

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terrain vehicles (ATV). Controversies arose over this use of the State-purchased property; the Green Acre program has a dual purpose of providing both for protecting the natural environment and for recreational purposes. State officials acknowledged that a public hearing would precede any final decision on the ATV park and that there would also be a review process by the State's Pinelands Commission, as well as possible other approval processes. As of the end of November, the Green Acres Program had acquired more than 238,000 ha of open space, with more than 12,100 ha in 2005 alone (Buena Vista Township Local News Clips, 2005§).

During 2005, the NJDEP, Division of Water Quality, in order to streamline processing time for specific classes of waste water discharge, developed a number of general permits. In issuing general permits by category, permit processing time is greatly reduced because rather than issuing tailored permits for each individual discharge, a standard set of conditions specific to a type of discharge were developed and issued. The general permits that were developed included ones for storm water discharges from asphalt producers, mining pits and quarries, and concrete producers.

Internet References Cited

Buena Vista Township Local News Clips, 2005 (November), ATV park funding draws ire, accessed July 12, 2007, at URL http://www.buenavistatownship.org/Media_Links_2005/Local%20News%20Clips/nov_2005.htm.

Journal Publications, Inc., 2005 (May 23), A question of power, NJBIZ—All business all New Jersey, accessed July 11, 2007, at URL http://carlinandwardpc.lawoffice.com/NJBIZ052305.pdf.

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN NEW JERSEY[1, 2]

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral	2003		2004		2005	
	Quantity	Value	Quantity	Value	Quantity	Value
Clays, common	W	W	W	122	W	W
Gemstones	NA	1	NA	1	NA	1
Sand and gravel:						
Construction	18,200	105,000	20,100	120,000	21,200	145,000
Industrial	1,570	32,700	2,020	35,800	1,820	34,100
Stone, crushed	24,800	179,000	25,400 r, 3	185,000 r, 3	22,700	160,000
Combined values of greensand marl, peat, stone (crushed miscellaneous [2004]), and values indicated by symbol W	XX	4,190	XX	4,400 r	XX	4,110
Total	XX	321,000	XX	345,000 r	XX	344,000

rRevised. NA Not available. W Withheld to avoid disclosing company proprietary data. Withheld values included in "Combined value" data. XX Not applicable.
[1]Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2]Data are rounded to no more than three significant digits; may not add to totals shown.
[3]Excludes certain stones; kind and value included with "Combined values" data.

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TABLE 2
NEW JERSEY: CRUSHED STONE SOLD OR USED, BY KIND[1]

Kind	2004 Number of quarries	2004 Quantity (thousand metric tons)	2004 Value (thousands)	2005 Number of quarries	2005 Quantity (thousand metric tons)	2005 Value (thousands)
Limestone	--	--	--	2	(2)	(2)
Granite	7	8,620	$61,600	8	8,110	$57,900
Traprock	15	16,800	124,000	15	14,500	102,000
Miscellaneous stone	(3)	W	W	(3)	(2)	(2)
Total	XX	25,400 r	185,000 r	XX	22,700	160,000

rRevised. W Withheld to avoid disclosing company proprietary data. XX Not applicable. -- Zero.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Withheld to avoid disclosing company proprietary data; included in "Total."
[3]Sales/distribution yards.

TABLE 3
NEW JERSEY: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2005, BY USE[1]

(Thousand metric tons and thousand dollars)

Use	Quantity	Value
Construction:		
Coarse aggregate (+1½ inch):		
Riprap and jetty stone	W	W
Filter stone	W	W
Other coarse aggregates	81	710
Coarse aggregate, graded:		
Concrete aggregate, coarse	W	W
Bituminous aggregate coarse	W	W
Railroad ballast	W	W
Other graded coarse aggregates	1,100	8,590
Fine aggregate (-⅜ inch):		
Stone sand, concrete	W	W
Stone sand, bituminous mix or seal	W	W
Screening, undesignated	884	5,180
Other fine aggregates	359	2,900
Coarse and fine aggregates:		
Graded road base or subbase	W	W
Unpaved road surfacing	W	W
Crusher run or fill or waste	W	W
Other coarse and fine aggregates	3,940	27,100
Other miscellaneous uses and specified uses not listed	414	3,670
Unspecified:[2]		
Reported	9,730	68,500
Estimated	4,700	33,000
Total	14,500	102,000
Grand total	22,700	160,000

W Withheld to avoid disclosing company proprietary data; included in "Grand total."
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Reported and estimated production without a breakdown by end use.

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TABLE 4

NEW JERSEY: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2005, BY USE AND DISTRICT[1, 2]

(Thousand metric tons and thousand dollars)

Use	District 1		District 3	
	Quantity	Value	Quantity	Value
Construction:				
Coarse aggregate (+1½ inch)[3]	W	W	--	--
Coarse aggregate, graded[4]	W	W	--	--
Fine aggregate (-⅜ inch)[5]	W	W	--	--
Coarse and fine aggregate[6]	W	W	--	--
Other miscellaneous uses	414	3,670	--	--
Unspecified:[7]				
Reported	9,730	68,500	--	--
Estimated	4,600	33,000	86	603
Total	22,700	160,000	86	603

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]No crushed stone produced for District 2.

[3]Includes filter stone, riprap and jetty stone, and other coarse aggregates.

[4]Includes bituminous aggregate (coarse), concrete aggregate (coarse), railroad ballast, and other graded coarse aggregates.

[5]Includes screening (undesignated), stone sand (bituminous mix or seal), stone sand (concrete), and other fine aggregates.

[6]Includes crusher run or fill or waste, graded road base or subbase, unpaved road surfacing, and other coarse and fine aggregates.

[7]Reported and estimated production without a breakdown by end use.

TABLE 5

NEW JERSEY: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2005, BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	4,810	$35,700	$7.42
Plaster and gunite sands	200	1,700	8.52
Concrete products (blocks, bricks, pipe, decorative, etc.)	100	1,390	13.89
Asphaltic concrete aggregates and other bituminous mixtures	3,820	25,200	6.60
Road base and coverings	569	3,500	6.15
Fill	1,060	4,600	4.34
Snow and ice control	72	464	6.44
Other miscellaneous uses[2]	198	2,450	12.39
Unspecified:[3]			
Reported	3,480	23,900	6.87
Estimated	6,900	46,400	6.72
Total or average	21,200	145,000	6.85

[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

[2]Includes filtration.

[3]Reported and estimated production without a breakdown by end use.

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TABLE 6

NEW JERSEY: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2005, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products[2]	1,520	14,600	1,620	14,500	1,960	9,690
Asphaltic concrete aggregates and road base materials	W	W	2,510	18,700	W	W
Fill	527	2,510	304	1,380	229	712
Other miscellaneous uses[3]	477	4,040	48	375	1,620	8,530
Unspecified:[4]						
Reported	--	--	2,080	13,900	1,400	10,000
Estimated	900	5,700	1,700	11,500	4,300	29,200
Total	3,380	26,900	8,280	60,300	9,550	58,100

W Withheld to avoid disclosing company proprietary data; included in "Other miscellaneous uses." -- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes plaster and gunite sands.

[3]Includes filtration, roofing granules, and snow and ice control.

[4]Reported and estimated production without a breakdown by end use.

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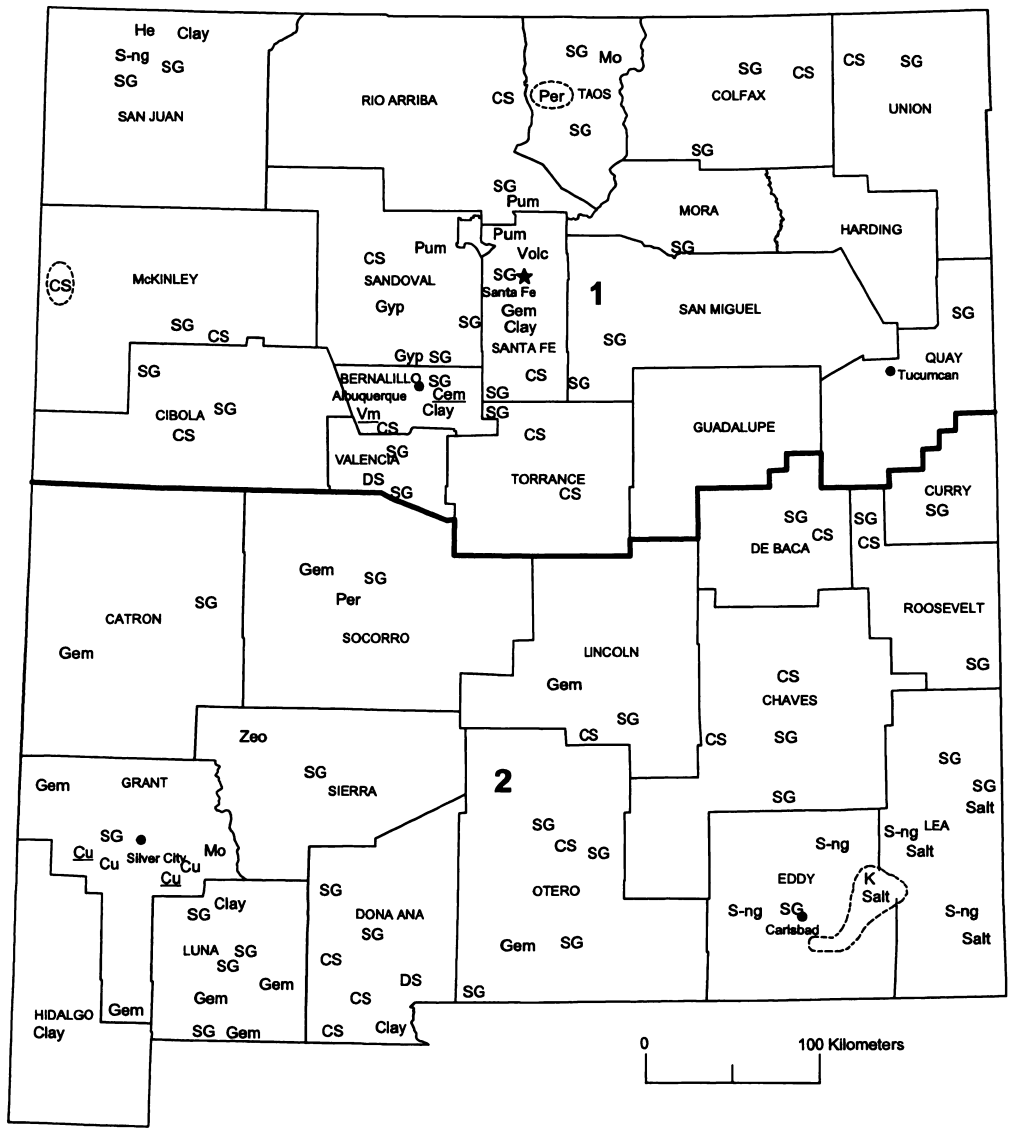
NEW MEXICO



LEGEND

- County boundary
- ★ Capital
- ● City
- 1 Crushed stone/sand and gravel districts

MINERAL SYMBOLS
(Major producing areas)

Cem	Cement plant
Clay	Common clay
CS	Crushed stone
Cu	Copper
Cu	Copper plant
DS	Dimension stone
Gem	Gemstones
Gyp	Gypsum
He	Helium
K	Potash
Mo	Molybdenum
Per	Perlite
Pum	Pumice
S-ng	Sulfur (natural gas)
Salt	Salt
SG	Construction sand and gravel
Vm	Vermiculite plant
Volc	Volcanic cinder
Zeo	Zeolites
⬭	Concentration of mineral operations

Source: New Mexico Bureau of Geology and Mineral Resources/U.S. Geological Survey (2005)

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THE MINERAL INDUSTRY OF NEW MEXICO

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the New Mexico Bureau of Geology and Mineral Resources for collecting information on all nonfuel minerals.

In 2005, New Mexico's nonfuel raw mineral production was valued[1] at $1.15 billion, based upon annual U.S. Geological Survey (USGS) data. This was a $282 million, or 33%, increase from the State's total nonfuel mineral value for 2004, which then had increased by nearly $300 million, or up 53%, from 2003 to 2004. The State rose to 19th from 20th in rank among the 50 States in total nonfuel mineral production value and accounted for more than 2% of the U.S. total. Yet, per capita, the State ranked 8th in the Nation in its minerals industry's value of nonfuel mineral production; with a population of about 1.93 million, the value of production was about $596 per capita.

The top nonfuel minerals in New Mexico in 2005 were, by value of production, copper and potash, followed by molybdenum concentrates, construction sand and gravel, and cement (portland and masonry). These five accounted for nearly 93% of the State's total nonfuel raw mineral production value. Copper continued to be the State's leading nonfuel mineral in 2005, accounting for about 44% of the State's total nonfuel value. Copper has led for 35 of the past 38 years (from 1968 through 2005). Potash (reported as potassium salts prior to 1990) had been the State's leading nonfuel mineral in the early 1950s through 1967, in 1982, and in 2002-03.

In 2005, the largest increases in value were those of copper, molybdenum concentrates, potash, construction sand and gravel, and pumice and pumicite (descending order of change). Smaller yet significant increases also took place in crushed stone, cement, and gold. The unit values rose in all eight mineral commodities, substantially for copper, molybdenum concentrates, potash, and pumice and pumicite. A 7.3% increase in the production of copper combined with a 29% increase in average price led to a 39%, or $140 million increase in the commodity's value. Even though there was only an 8.5% increase in the production of molybdenum concentrates, there was a nearly 100% rise in its overall total value. Similarly, despite a larger decrease in the quantity of potash produced (than the decrease that took place in molybdenum concentrates), there was a very significant $48 million rise in its value. Also, pumice and pumicite production increased slightly, but the commodity's total value increased more than 200%. The unit values of construction sand and gravel and crushed stone were up 6% and 15%, respectively (table 1).

Nearly all the State's molybdenum concentrate was mined and processed at Molycorp Inc.'s Questa Mine and mill in Taos County; the remainder was produced as byproduct from copper processing from Phelps Dodge Corp.'s Chino Mine in Grant County. The trend toward the recent heights in molybdenum concentrate prices began in June 2002 and continued on throughout 2003 and 2004, peaking in 2005. For example, as reported in Platts Metals Week (there in dollars per pound of contained molybdenum) the annual average price of molybdic oxide rose from $8.27 per kilogram (kg) in 2002 to $11.75 per kg in 2003 to $36.73 per kg in 2004 and nearly doubled to $70.10 per kg in 2005. In June 2005, the monthly average molybdic oxide price reached its highest point of the 4-year run at $82.54, and then followed a generally downward trend the rest of the year to close at $61.84. Molybdenum concentrate prices had stayed relatively level during the early months of 2006. With rising and overall higher average metal prices, byproduct gold and byproduct silver were produced from the processing of copper at Phelps Dodge operations in Grant County.

In 2005, New Mexico continued to lead the Nation in the quantities of potash, perlite, and zeolites produced (descending order of value) and remained third in copper, fourth in pumice and pumicite, sixth in molybdenum concentrates, and eighth in silver. The State continued to rank ninth of 11 gold-producing States and was a significant producer of construction sand and gravel and gypsum.

The following narrative information was provided by the New Mexico Bureau of Geology and Mineral Resources[2] (BGMR). Production data and information in the text that follows are those reported by the BGMR and are based on the agency's own surveys and estimates, data obtained from the New Mexico Department of Energy, Minerals, and Natural Resources, Mines and Minerals Division, personal mine visits by the BGMR staff, and cited references. These may differ from some production figures published by the USGS.

Overview and Trends

Mining and exploration in New Mexico continued to increase from the lower levels of the early 2000s as most commodity prices continued to rise in 2005 along with worldwide demand for minerals increasing. About 245 mine and primary mineral processing operations were active in the State in 2005, including 195 aggregate and stone operations, 2 copper mines and related concentrators and solvent extraction and electrowinning (SX/EW) plants, 1 copper smelter, 1 molybdenum mine and mill, 3 potash mines and 4 potash mills, and about 43 other industrial mineral mines and mills. Aggregate, stone, and other industrial mineral operations on Native American Indian Lands were not included in these numbers (Kamat, 2007). Reclamation activities increased during 2005, and nearly every company in the State had comprehensive reclamation plans for their active mines.

[1]The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2005 USGS mineral production data published in this chapter are those available as of December 2006. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—can be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

[2]Virginia T. McLemore, Senior Economic Geologist, authored the State mineral industry information provided by the New Mexico Bureau of Geology and Mineral Resources.

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Exploration and Development

In 2005, Phelps Dodge Corp. initiated permitting for the startup of production at the company's Cobre copper mine, formerly the Continental Mine. In early 1998, Phelps Dodge acquired Cobre Mining Co., Inc., which included the open pit mine, two underground mines, two mills, and 4,450 hectares (ha) (11,000 acres) of land surrounding the operations. Later that year, Phelps Dodge suspended underground mining at Cobre owing to low copper prices. On March 17, 1999, the remaining operations were suspended and the entire operation remained on care-and-maintenance status. Estimated leaching reserves were about 100 million metric tons (Mt) of ore grading 0.35% Cu (Phelps Dodge Corporation, 2006§[3]). Most of the copper reserves at the Cobre Mine were in the Syrena limestone and upper part of the Lake Valley limestone north of the Barringer fault.

Several companies explored for gold and silver throughout New Mexico, especially in Catron, Dona Ana, Grant, Lincoln, Rio Arriba, and Socorro Counties.

Commodity Review

Industrial Minerals

Cement (Portland and Masonry).—Portland cement was a principal construction material produced in New Mexico. Masonry cement was also produced in the State, especially for use in mortar and stucco. Cement commonly refers to hydraulic cement, those cements that have the property of hardening under water and are the chief binding agents for concrete and masonry. Portland cement, the name patented in Leeds, England, in 1824, was named for the set cement that resembled a building stone quarried from the Isle of Portland off England's southern coast; today it is the predominant variety of hydraulic cement. New Mexico produced hydraulic cement from the Tijeras cement plant operated by Grupos Cementos de Chihuahua (GCC) near Albuquerque; estimated annual capacity of the plant was 454,000 metric tons (t) [500,000 short tons (st)] per year of cement. In 2005, a cement shortage in the State resulted in high prices for the commodity (New Mexico Business Weekly, 2006§). GCC's Tijeras cement plant was commissioned in 1959 and GCC took over operations in 1994. The main ingredient in cement is limestone, which was mined at Tijeras with additional varying quantities of alumina, gypsum, iron, and sandstone/shale (locally obtained from throughout New Mexico).

Clays.—Two types of clay were mined in New Mexico: common clay as well as some fire clay. Common clay, which typically made up most of the State's production, was used for making bricks, quarry tile, and roofing granules. Commercial adobe yards, which produced adobe bricks from local alluvial materials, were mostly in northern New Mexico. Bricks were also manufactured at the Kinney Brick Co.'s brick mill in Albuquerque, Bernalillo County, and American Eagle Brick Co.'s Eagle plant in Sunland Park, Dona Ana County.

Gemstones.—Gemstones and semiprecious stones were produced in New Mexico, including agate, azurite, fluorite, geodes, moonstone, onyx, peridot, smithsonite, and turquoise. Specific production statistics for 1998-2005 are withheld for gemstones and semiprecious stones in New Mexico (proprietary data), in part because many noncommercial collectors do not report their income. In 1993, the value of gemstone production was estimated to be about $22,000 and the average during the previous 5 years was approximately $76,000, mostly from turquoise (Austin, 1994). However, owing to the depletion of identified resources and difficulties and expenses involved in adhering to Federal, State, and local environmental regulations, most of the commercial mines in the State have closed during the past 12 to 13 years.

Gypsum.—Centex American Gypsum Co. operated the White Mesa Mine near Cuba, Sandoval County, and two wallboard plants in Albuquerque and Bernalillo County. Other smaller gypsum mines were operated in Dona Ana and Sandoval Counties.

Perlite.—In New Mexico, perlite is found in high-silica rhyolite (lava) flows and domes that were emplaced typically 3.3 to 7.8 million years ago (Barker and others, 1996; Chamberlin and Barker, 1996). Perlite was produced at three mine and mill operations in New Mexico: Dicaperl Minerals Corp.'s El Grande and Socorro mines and mills and Harborlite Corp.'s No Agua mine and mill.

Potash.—The Carlsbad potash district was the leading potash producing area in the United States. Intrepid Mining LLC and Mosaic Co. operated underground mines in that district. The minerals langbeinite and sylvite were the primary potash minerals found in Permian Age evaporites of the Permian Basin in New Mexico (Barker and Austin, 1996). The estimated potash reserves in the district amounted to more than 500 Mt.

Mosaic Co., which resulted from the merger of Cargill Crop Nutrition Corp. and IMC Global Inc. on October 22, 2004, became the world's leading potash and phosphate producer (The Mosaic Company, 2005§). The capacity of the Mosaic potash mines was about 500,000 t of red potash and nearly 1.2 Mt of potassium-magnesium sulfate (K-Mag). In 2005, Mosaic produced 3.7 Mt of ore containing 12.6% K_2O equivalent of red potash and 3.3 Mt of ore containing 7.4% K_2O equivalent of K-Mag (The Mosaic Company, 2006§). The total reserves at Mosaic included an estimated total of about 110 Mt of potash ore ranging in thickness from 1.4 meters to more than 3.4 meters. These ore reserves were estimated to yield 5 Mt of concentrate from sylvinite with an average grade of 60% K_2O equivalent and more than 18 Mt of langbeinite concentrate with an average grade of approximately 22% K_2O equivalent. These reserves were expected to last 15 to 23 years.

Intrepid Mining NM LLC, owned by Intrepid Mining, LLC, announced in early March that it had completed the acquisition of all the assets of Eddy Potash, Inc. and Mississippi Potash, Inc., which included four potash properties in Carlsbad, NM, for approximately $27.4 million and thereby becoming the leading potash producer in the United States (Intrepid Mining NM LLC, 2004§). Intrepid employed approximately 650 people at three facilities in New Mexico. The West Facility, which consisted of a potash mine and refinery originally built in

[3]References that include a section mark (§) are found in the Internet References Cited section.

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1929 by U.S. Potash Corp., had an annual production capacity of approximately 463,000 t of red potash. The East Facility, consisting of a potash mine, refinery, and compaction plant, had an annual production capacity of approximately 354,000 t of white potash and 227,000 t of lansbeinite. The North facility consisted of a granular compaction plant and storage facilities (Intrepid Potash - New Mexico, LLC, 2006§). Two types of ore were processed. Flotation was used to produce red potash and hot-leach crystallization was used to produce the higher purity white potash. In August 2005, the East Mill returned to a 24 hour, 7-day schedule in preparation for the startup of the company's new Langbeinite facility.

Pumice and Pumicite.—In New Mexico, pumice is found in the Jemez Mountains and the Mogollon-Datil volcanic field (Hoffer, 1994); however, only seven operations were active in New Mexico in 2005. Copar Pumice Company, Inc., which has been in the pumice mining industry for more than 40 years, produced pumice from two quarries, the El Cajete Mine and the Guaje Canyon Mine. An expansion of the El Cajete pumice mine in the Jemez Mountains was delayed awaiting the preparation of a final environmental impact statement (original draft released early 1997). The mine opened in 1997 with operation originally planned for 10 years. Reserves were estimated to be 90,700 t (100,000 st) of pumice to be used in making stonewashed jeans. Other pumice mines were active in the region.

Salt.—United Salt Corp. acquired a solar evaporation salt plant near Carlsbad in 1962 (United Salt Corp., 2006§). Here, the company harvested the salt on a 1,050-ha salt lake after the sun and wind evaporated the water from the brine. The salt was then carefully washed three times before it was packaged into a variety of solar salt products. Originally, the salt at Carlsbad was sold as deicing salt for roads. In recent years, the salt has been used in agricultural feed products, chemical feed stocks, water conditioning, and swimming pool chlorine generation and numerous other industrial applications.

Zeolites.—St. Cloud Mining Co. (a subsidiary of Imagin Minerals, Inc.) operated the largest zeolite mine in the Nation at the Stone House Mine in Sierra County. Imagin Minerals, Inc. bought the St. Cloud Mining Co. from The Goldfield Corp. in December 2002. St. Cloud Mining Co. has operated the open pit mine since 1993. The mining properties consisted of approximately 607 ha (1,500 acres) and contained 16.6 Mt of reserves with an annual capacity of 90,700 t (St. Cloud Mining Co., 2006§). Clinoptilolite was found in the altered Tertiary age tuff of Little Mineral Creek (White and others, 1996). Clinoptilolite was mined, crushed, dried, and sized without beneficiation and shipped packaged to meet customer's specifications. St. Cloud Mining Co. also, in the past several years, made several modifications to its zeolite operation, including the addition of cation exchange capacity for added-value products and additional classification capabilities to expand markets for their products. The modern facility had the crushing and sizing capacity of 454 t (500 st) per day.

Other Industrial Minerals.—Small flagstone dimension stone operations were located throughout New Mexico that produced sandstone, travertine, and other ornamental rock. The largest was New Mexico Travertine, Inc., a fully integrated stone processing plant, located south of Albuquerque, near Belen.

Helium was produced from the Shiprock and Ute Dome fields in the San Juan Basin. Helium was used in cryogenic applications, welding cover gas, pressurizing and purging, controlled atmospheres, leak detection, gas mixtures, and other uses.

Humates are weathered coal or highly organic mudstone that are found in the coal-bearing sequences. New Mexico has significant deposits of humates, predominantly in the Fruitland and Menefee formations in the eastern San Juan Basin. Humate was produced from five mines in New Mexico. Horizon Ag Products Inc.'s mine and mill were south of Cuba, Sadoval County. Menefee Mining Corp. operated one pit and a mill near Cuba. The mining operations, processing site, and transportation facility of U-Mate International, Inc. were located in the Gallup (McKinley County) area. Rammsco, Inc.'s Eagle Mesa mine was near Cuba, and the Morningstar Mine was in San Juan County. Humate is used as a soil conditioner and as an additive to drilling muds. Approximately 11 billion t of humate resources was estimated to be within the San Juan Basin (Hoffman and others, 1996).

Magnetite was produced from the stockpiles at Cobre Mining Co.'s (Phelps Dodge Corp.) Continental Mine and used in cement production and other minor uses.

Silica flux was produced from several quarries in Grant County for the Phelps Dodge Corp. copper mill.

Although garnet has not been produced in New Mexico from 1998 through 2004, at least one company was examining areas in the State for potential resources for uses as an abrasive. Garnet typically is found in skarn deposits in southern and central New Mexico and in some areas, garnet is a major constituent of waste rock piles remaining after recovery of metals (Lueth, 1996). For example, approximately 135,000 t of material grading 20% to 36% garnet was estimated to occur in four tailings piles at Hanover (Cetin and others, 1996). During 2005, domestic values for crude concentrates for different applications ranged from about $58 to $120 per metric ton, with an average for the year of $96 per ton. The domestic values for refined garnet for different applications sold during the year ranged from $61 to $298 per ton, with an average for the year of $268 per ton (Olson, 2007, p. 29.2).

Metals

Copper.—In 2005, Phelps Dodge Corp. continued to leach copper at the Chino Mine at Santa Rita and the Tyrone Mine in New Mexico. The company's Hurley smelter was permanently closed in 2005 and reclamation started.

The Chino Mine was the largest identified porphyry copper deposit in New Mexico. Copper sulfides were found in the upper, fractured granodiorite and adjacent sedimentary rocks. Adjacent copper skarns have become increasingly more important economically. In 2005, Chino produced 49,100 t of copper by SX/EW and 46,000 t of copper in concentrate (Phelps Dodge Corporation, 2006§). Estimated milling reserves in 2005 were nearly 65.9 Mt of ore grading 0.70% copper and 0.02% molybdenum and estimated leaching reserves were 142 Mt of ore grading 0.40% copper (Phelps Dodge Corporation, 2006§).

The Tyrone porphyry copper deposit in the Burro Mountains is within a quartz monzonite laccolith and adjacent Proterozoic Age

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rocks. There are several ore bodies, sometimes considered separate porphyry copper deposits, within the deposit. Phelps Dodge's concentrator processed approximately 270 Mt of ore grading 0.81% copper from 1969 to 1992. The mill then closed and the mine began processing exclusively by heap-leach methods. In 2005, more than 36,700 t of electrowon copper was produced. In 2005, leaching reserves were estimated as 44.7 Mt of ore grading 0.29% copper (Phelps Dodge Corporation, 2006§). In addition, the nearby Niagara deposit contained 454 Mt of mineralized material grading 0.29% copper as of December 2000. This mineralized material could be brought into production should market conditions warrant.

Gold and Silver.—All the gold and silver production in New Mexico was as byproduct recovery from copper refining by Phelps Dodge in 2005 and amounted to 304 kg (9,764 troy ounces) gold and 6,340 kg (203,672 troy ounces) silver (Phelps Dodge Corporation, 2006§).

Molybdenum.—Molycorp Inc.'s (a subsidiary of Unocal Corp.) Questa molybdenum mine operated continuously from 1923 through 1986 when soft market conditions (low prices) caused the temporary shutdown of the mine until 1989. Mining operations again were placed on standby in 1992 and resumed in 1995. The price of molybdenum has increased during the past decade, in particular during the past 3 years.

The company mined some 73.5 Mt of ore from its open pit at a grade of 0.191% molybdic oxide between 1965 until 1983. Underground block caving of ore commenced in 1983 continuing through 2005. In 2005, production was about 1,600 t (3.5 million pounds) of molybdenum in concentrates. In 2005, ore grade ranged between 0.3% and 0.5% molybdenum. Reserves and resources (as of November 1999) at Questa were: (1) proven reserves of more than 1.5 Mt of 0.343% molybdenum disulfide (MoS_2) at a cutoff grade 0.25% MoS_2; (2) probable reserves estimated to be more than 40 Mt of 0.315% MoS_2; and (3) possible estimated resources of nearly 3 Mt of 0.369% MoS_2.

With proven and probable reserves considered, the mine life was expected to be 25 to 35 years. More than 200 people worked at the mine in 2005. For comparison, Phelps Dodge Corp. reports molybdenum reserves in 2005 at its Climax Molybdenum Co.'s Climax Mine and Henderson Mine (both in Colorado), to be 142 Mt of 0.19% Mo and 137 Mt of 0.21% Mo, respectively (Phelps Dodge Corporation, 2006§).

Molycorp Inc. also continued with a reclamation and revegetation program to cover overburden rock piles at the inactive open pit site.

Outlook

Nonfuel mineral production in New Mexico, as well as the total value of that production, had declined since maximum annual minerals production was achieved in 1989 (McLemore and others, 2002). The total nonfuel mineral production value temporarily trended up and was slightly higher in 1995, but in 1996 and thereafter, the value trended downward again, reaching its lowest levels from 2001 through 2003. During 2004 and 2005, most production values increased, obtaining near record values. Higher commodity prices and increased production resulted in a more than 50% increase (table 1) in nonfuel mineral production values from 2003 to 2005. New records were set for values of production of molybdenum and potash. Aggregate production and production value also broke previous records (New Mexico Energy, Minerals and Natural Resources Department Mining and Minerals Division, 2006§). These trends, especially in aggregate (construction sand and gravel, and crushed stone), copper, gold (and silver), and most other industrial minerals, were expected to continue well into 2006. Molybdenum production value was thought likely to decrease somewhat in 2006 (New Mexico Energy, Minerals and Natural Resources Department Mining and Minerals Division, 2007§). In part because molybdenum prices trended downward in late 2005, though leveling off somewhat in early 2006, a return to the record high price levels of 2005 was not anticipated.

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TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN NEW MEXICO[1, 2]

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral	2003 Quantity	2003 Value	2004 Quantity	2004 Value	2005 Quantity	2005 Value
Clays, common	36	209	34	177	36	221
Copper[3]	88	165,000	122	362,000	131	502,000
Gemstones	NA	20	NA	20	NA	19
Sand and gravel:						
Construction	13,300	65,300	13,600	89,500	16,000	112,000
Industrial	--	--	--	--	113	W
Silver kilograms	--	--	3,570	767	6,390	1,510
Stone:						
Crushed	3,730	26,000	2,830 r	16,400 r	3,010	20,100
Dimension	57	2,590	57	2,430	7	279
Combined values of cement, gold (2004-05), gypsum (crude), helium (Grade-A [2003-04]), lime, mica (crude [2003-04]), molybdenum concentrates, perlite (crude), potash, pumice and pumicite, salt, stone (crushed granite [2004]), zeolites (2004-05), and values indicated by symbol W	XX	310,000	XX	397,000 r	XX	513,000
Total	XX	569,000	XX	868,000 r	XX	1,150,000

rRevised. NA Not available. W Withheld to avoid disclosing company proprietary data. Withheld values included in "Combined value" data.
XX Not applicable. -- Zero.
[1]Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2]Data are rounded to no more than three significant digits; may not add to totals shown.
[3]Recoverable content of ores, etc.

TABLE 2
NEW MEXICO: CRUSHED STONE SOLD OR USED, BY KIND[1]

Kind	2004 Number of quarries	2004 Quantity (thousand metric tons)	2004 Value (thousands)	2005 Number of quarries	2005 Quantity (thousand metric tons)	2005 Value (thousands)
Limestone	15 r	2,250 r	$12,300 r	15	2,250	$13,800
Granite	1	W	W	1	(2)	(2)
Sandstone	1	3	15	1	(2)	(2)
Volcanic cinder and scoria	8 r	277	2,040	9	338	2,620
Miscellaneous stone	4	296 r	2,030 r	3	240	1,820
Total	XX	2,830 r	16,400 r	XX	3,010	20,100

rRevised. W Withheld from total to avoid disclosing company proprietary data. XX Not applicable.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Withheld to avoid disclosing company proprietary data; included in "Total."

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TABLE 3
NEW MEXICO: CRUSHED STONE SOLD OR USED BY PRODUCERS
IN 2005, BY USE[1]

(Thousand metric tons and thousand dollars)

Use	Quantity	Value
Construction:		
Coarse aggregate (+1½ inch), riprap and jetty stone	W	W
Coarse aggregate graded:		
Concrete aggregate, coarse	114	1,030
Bituminous aggregate, coarse	W	W
Bituminous surface-treatment aggregate	W	W
Railroad ballast	W	W
Other graded coarse aggregate	378	1,210
Fine aggregate (-⅜ inch):		
Stone sand, concrete	147	1,270
Screening, undesignated	W	W
Other fine aggregate	16	137
Coarse and fine aggregates:		
Graded road base or subbase	66	427
Unpaved road surfacing	W	W
Crusher run or fill or waste	W	W
Chemical and metallurgical, cement manufacture	W	W
Other miscellaneous uses and specified uses not listed	140	1,510
Unspecified:[2]		
Reported	366	1,960
Estimated	1,700	11,000
Total	2,020	13,200
Grand total	3,010	20,100

W Withheld to avoid disclosing company proprietary data; included in "Grand total."
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Reported and estimated production without a breakdown by end use.

TABLE 4
NEW MEXICO: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2005,
BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

	District 1		District 2		Unspecified districts	
Use	Quantity	Value	Quantity	Value	Quantity	Value
Construction:						
Coarse aggregate (+1½ inch)[2]	W	W	W	W	--	--
Coarse aggregate, graded[3]	W	W	W	W	--	--
Fine aggregate (-⅜ inch)[4]	W	W	W	W	--	--
Coarse and fine aggregates[5]	W	W	W	W	--	--
Chemical and metallurgical[6]	--	--	W	W	--	--
Other miscellaneous uses	89	1,030	51	480	--	--
Unspecified[7]						
Reported	171	1,000	129	551	68	406
Estimated	705	4,800	946	6,400	--	--
Total	1,560	10,000	1,390	9,660	68	406

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes riprap and jetty stone.
[3]Includes bituminous aggregate (coarse), bituminous surface-treatment aggregate, concrete aggregate (coarse), railroad ballast, and other graded coarse aggregates.
[4]Includes screening (undesignated), stone sand (concrete), and other fine aggregates.
[5]Includes crusher run or fill or waste, graded road base or subbase, and unpaved road surfacing.
[6]Includes cement manufacture.
[7]Reported and estimated production without a breakdown by end use.

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TABLE 5
NEW MEXICO: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2005, BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	1,440	$11,400	$7.91
Plaster and gunite sands	128	1,220	9.50
Concrete products (blocks, bricks, pipe, decorative, etc.)	30	72	2.40
Asphaltic concrete aggregates and other bituminous mixtures	2,670	24,100	9.01
Road base and coverings[2]	2,780	18,200	6.56
Fill	829	4,030	4.86
Other miscellaneous uses[3]	682	12,300	18.07
Unspecified:[4]			
Reported	5,350	28,100	5.25
Estimated	2,100	12,900	6.08
Total or average	16,000	112,000	7.01

[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.
[2]Includes road and other stabilization (cement and lime).
[3]Includes railroad ballast and snow and ice control.
[4]Reported and estimated production without a breakdown by end use.

TABLE 6
NEW MEXICO: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2005, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		Unspecified districts	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregates and concrete products	663	5,890	803	5,540	--	--
Plaster and gunite sands	102	867	14	155	12	194
Asphaltic concrete aggregates and other bituminous mixtures	1,970	18,400	648	5,300	52	346
Road base and coverings[2]	1,420	9,610	887	5,700	476	2,940
Fill	549	3,230	257	735	23	69
Other miscellaneous uses[3]	482	9,760	191	2,540	9	30
Unspecified:[4]						
Reported	3,560	24,000	248	1,020	1,540	3,040
Estimated	600	3,600	1,500	9,300	--	--
Total	9,330	75,400	4,580	30,200	2,110	6,620

-- Zero.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes road and other stabilization (cement and lime).
[3]Includes railroad ballast and snow and ice control.
[4]Reported and estimated production without a breakdown by end use.

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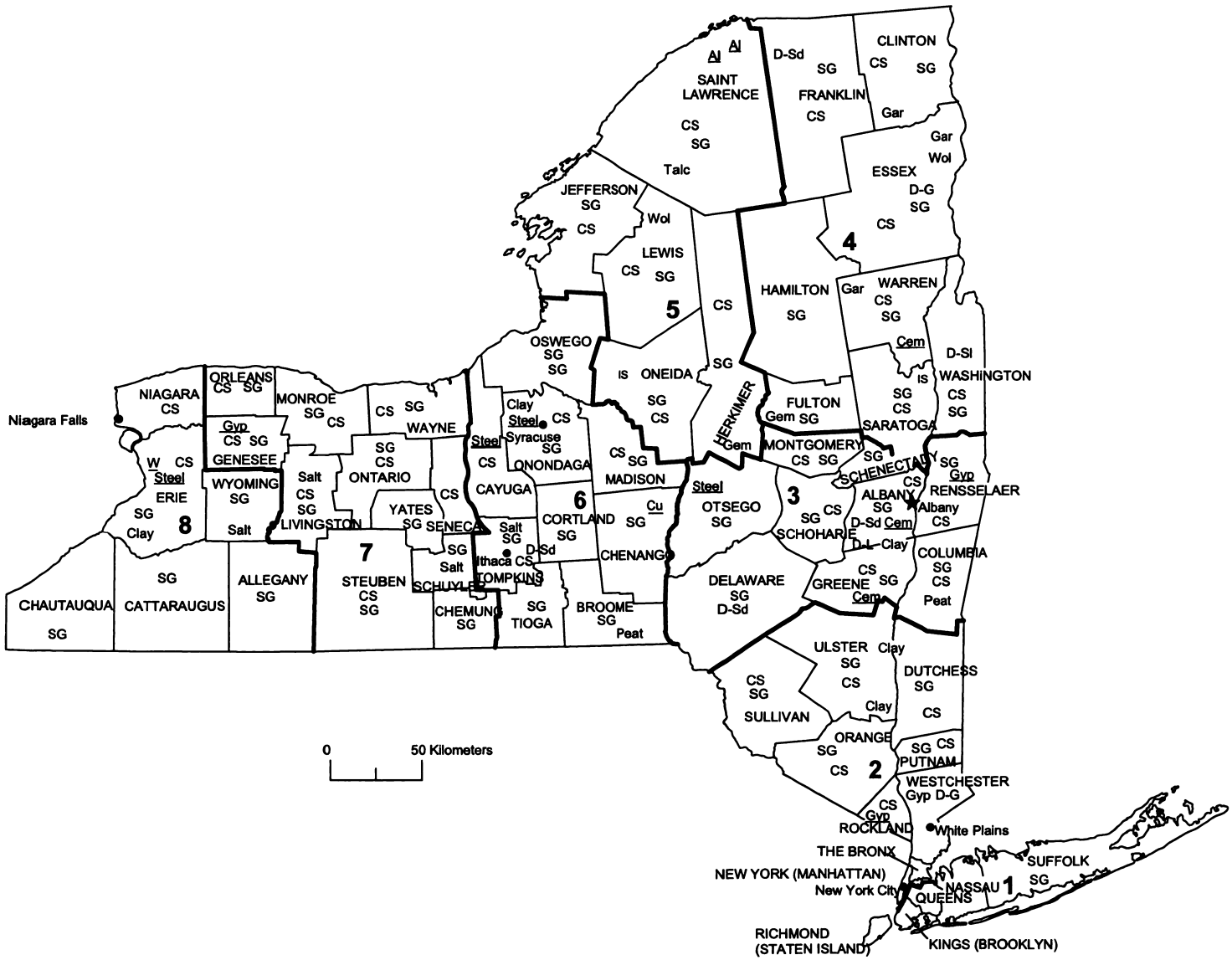

LEGEND

- County boundary
- ★ Capital
- ● City
- 1 — Crushed stone/sand and gravel districts

MINERAL SYMBOLS
(Major producing areas)

Al	Aluminum plant
Cem	Cement plant
Clay	Common clay
CS	Crushed stone
Cu	Copper plant
D-G	Dimension granite
D-L	Dimension limestone
D-Sd	Dimension sandstone
D-Sl	Dimension slate
Gar	Garnet
Gem	Gemstones
Gyp	Gypsum
Gyp	Gypsum plant
IS	Industrial sand
Peat	Peat
Salt	Salt
SG	Construction sand and gravel
Steel	Steel plant
Talc	Talc
W	Tungsten
Wol	Wollastonite

Source: New York State Geological Survey/U.S. Geological Survey (2005)

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THE MINERAL INDUSTRY OF NEW YORK

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the New York State Geological Survey for collecting information on all nonfuel minerals.

In 2005, New York's nonfuel raw mineral production was valued[1] at $1.29 billion, based upon annual U.S. Geological Survey (USGS) data. This was an 18.3% increase from the $1.09 billion total value for 2004, which was up 9% from that of 2003. The State was 15th in rank (14th in 2004) among the 50 States in total nonfuel mineral production value, of which the State accounted for more than 2.3% of the U.S. total value.

In 2005, crushed stone, by value, remained New York's leading nonfuel mineral, followed by salt, cement (portland and masonry), construction sand and gravel, and wollastonite. These five mineral commodities accounted for more than 97% of the State's total nonfuel mineral production value. Crushed stone led New York's increase in value; a nearly 7% increase in production generated a 36%, or $118 million increase in the commodity's value—a substantial increase in unit value. Although cement production was down slightly, its total value rose by nearly $30 million. The total value of salt production increased by $26 million and those of construction sand and gravel (production down 5%) and crude gypsum (occasional producers resumed production) went up $15 million and $11 million, respectively. Smaller, yet significant increases also took place in the values of dimension stone, wollastonite, and industrial garnet (descending order of change) (table 1). The only decreases in value were somewhat small decreases in the values of industrial sand and gravel (no production) and talc.

In 2005, New York continued to be the only State to produce wollastonite, as well as first in the quantity of industrial garnet produced of three producing States, third in the production of salt, and fourth in talc. The State rose to fourth in the production of crude gypsum and to eighth from ninth in dimension stone production. Additionally, New York mining and mineral processing operations produced significant quantities of, in descending order of value, crushed stone (14th in rank), portland cement (13th), construction sand and gravel (14th), masonry cement (13th), and common clays (14th). Primary aluminum and raw steel were produced from materials obtained from foreign and other domestic sources. With a significant increase in primary aluminum production in 2005, New York rose to fourth from seventh in rank among 12 producing States.

The following narrative information was provided by the New York State Geological Survey[2] (NYSGS) and the Division of Mineral Resources (DMR) of the New York State Department of Environmental Conservation (DEC). Continuing the trend of the last few years, the number of permitted nonfuel mineral mining operations in New York decreased in 2005. Of the 2,249 active mines, which were located in 56 of the State's 62 counties, 1,759 operations were run by the private mining industry and 490 were run by local or State government entities. In 2005, the DEC issued a total of 411 mine permits, 66 for new operations and 345 for either renewals or modifications. Of the new operations, 53 were for sand and gravel, 4 for bluestone, 6 for shale, and 1 each for limestone, granite, and slate.

On a limited basis near yearend, operations were resumed at the furloughed Balmat zinc mine in St. Lawrence County. As a result of low zinc prices, the mine had been maintained on a care-and-maintenance basis since May 2001. The mine was operated by St. Lawrence Zinc Co. (a subsidiary of Hudson Bay Mining and Smelting Co). This vertically integrated Canadian mining company was the producer of copper, zinc, and precious metals from its mines and plants in Manitoba and Saskatchewan. At the mine, St. Lawrence Zinc planned additional exploratory drilling and a full reopening when economic conditions permit.

Overall, nearly 19,800 hectares (ha) (nearly 48,900 acres) in New York was affected by mining in 2005 from a total life-of-mine approved area of 45,600 ha. In 2005, seven counties (Albany, Dutchess, Genesee, Onondaga, Ontario, Rensselaer, and Rockland) had between 0.36% to 0.44% of their land surface under a mining permit. For most of the State's counties with active mines, less than 0.25% of the land is covered by mining permits.

Exploration and Development

The main focus of exploration and development for the mining industry the past several years has been to expand existing operations, including sand and gravel and hard rock quarries. In Onondaga County, the owner of a 733-ha (1,810-acre) limestone mine, which dates back to 1878, applied for a 46-ha permit modification to mine an area currently occupied by waste stone remaining from 125 years of operation. The company proposed to process more than 33 million metric tons of stone into marketable products in order to uncover the original quarry floor, after which it would mine the limestone to the depth already authorized for the surrounding mine. Although no changes were planned in the mine's overall production,

[1]The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2005 USGS mineral production data published in this chapter are those available as of December 2006. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—can be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

[2]William Kelly, State Geologist of New York, authored the text of the State mineral industry information provided by the New York State Geological Survey (a bureau of the New York State Museum in the State Education Department), Division of Research and Collections in collaboration with the New York State Department of Environmental Conservation, Division of Mineral Resources.

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and this part of the mine would be grandfathered into the overall mine plan, the DEC staff had the task to evaluate the applicability of the State Environmental Quality Review Act provisions.

The DEC received an application for one new limestone mine by a company in Clinton County. The site, surrounded by wetlands on three sides, was in a rural area of abandoned farms and scattered residences. The applicant proposed dewatering the site into the adjoining wetlands. An interstate highway, 61 meters (m) (200 feet) east of the proposed mine, would provide an excellent transportation route. In Wayne County, a sand and gravel operation applied to the DEC for a 324-ha expansion to its permitted life-of-mine area.

Controversy not uncommonly surrounded proposals to expand existing mines in several areas of the State. This was true for expansions that were horizontal or vertical (or both) of the footprint of the mine, as well as such changes as going from sand and gravel extraction to mining the underlying bedrock. The main issues associated with these operations have been assessing the effects of mining to the underlying water table and water aquifers. Other issues of concern to the public continued to include noise, blasting, traffic, visual impacts, environmental justice, and extended life-of-mine terms. An Erie County crushed stone producer proposed to move its processing and asphalt plants from its existing locations to mine the stone resources beneath the plant and its surrounding area. Town officials, citizen group representatives, and individual neighbors identified zoning, traffic, odor, dust, and blasting issues as problematic.

Significant public opposition arose regarding plans to deepen or expand existing life-of-mine permits in localities Statewide. One example was a proposed permit modification to mine 30 m deeper at an operation in Rensselaer County. The proposal would require excavation below the water table. Hearings were held regarding the impact of the mine on wells and its discharge to the stream that would be required to dewater the mine. In another case, a Schoharie County producer's proposal to expand its operation from 35 to 63 ha drew significant public opposition. On Long Island, a similar opposition arose to a proposal to modify an existing mining permit to allow for an increase in the final size and depth of an excavation pond. Since towns in New York in recent years have been zoning out mining in new areas, this proposal has been part of an increasing trend toward deeper mines on Long Island and elsewhere in New York.

Mine Reclamation and Awards

A total of about 540 ha was reclaimed in 2005, comprised of more than 325 ha at closed mines and nearly 215 ha of concurrent reclamation. Since 1975, more than 9,710 ha of land affected by mining have been reclaimed. In 2005, the DEC collected $2.6 million in annual regulatory fees from industry and State-owned mines. Mines owned by other governmental entities are exempt.

The DEC Mined Land Reclamation Program (MLRP) held $107 million in financial security to guarantee mine reclamation. However, recent experience with reclamation work contracted by the DEC demonstrated that individual mine financial security amounts were too low. Based upon 2005 prices, approximately two-thirds of existing Mined Land Reclamation Permits had bonds that would not cover reclamation costs if the sites were abandoned. Because the State's Mined Land Reclamation Law gives the DEC the authority to set bonds at the level necessary to adequately reclaim a mine, the agency increased reclamation bonds to an average of about $12,000 per hectare ($5,000 per acre) at the time of mining permit renewal. The DEC performed 1,982 mine inspections, traveling more than 338,000 km (210,000 miles) in 2005.

The MLRP collected in excess of $116,000 in fines and penalties. The DEC staff, in cooperation with the U.S. Department of Agriculture, the U.S. Department of the Interior's Fish and Wildlife Service, and the Sullivan County Soil Conservation Service, designed and implemented a reclamation project in Sullivan County. The site, near the Delaware River, was enrolled in the Wildlife Habitat Incentive Program, which was planned to be a prototype for future reclamation efforts. The site was to be graded, dotted with small, spring-fed ponds, and planted with warm season grasses. In addition, the DEC reclaimed abandoned mines in Chautauqua and Chenango Counties using seized financial security. The 10.5-ha Chenango County site is the largest such project undertaken to date by the DEC.

In the aftermath of the AKZO, Inc. Retsof salt mine failure, a desalinization plant was under construction in Livingston County. The purpose of the plant was to stabilize the level of salt-contaminated ground water rising in that area of the flooded mine. The AKZO Brine Mitigation Project states that this will prevent the brine from mixing with and degrading the quality of the ground water in the bedrock and surficial aquifers. Salt water levels have been rising owing to the slow closure of the flooded mine. As mine space is reduced, salt water is forced up the collapse and into the overlying aquifer. Salt from the desalinization plant will be pelletized and marketed for use in water softeners, and the purified water will augment the drinking water supply of the local community.

In 1998, United States Gypsum Co. (USG) decommissioned their underground mine in Genesee County. The DEC is working with USG to establish closure and monitoring timetables.

The 2005 NYS Mined Land Reclamation Award was presented to a mining company called It's Greener Now in Schuyler County. The company reclaimed 24 ha of abandoned mine land, which after grading and revegetation now supports a herd of 32 elk. The elk farm, in close proximity to Watkins Glen State Park, was expected to become a popular tourist destination. Another company in Cattaraugus County dedicated a new public fishing site on a portion of its mining property. Some 162 ha of excavated lakes at the reclaimed site was made available to the public. A reclamation project in Broome County offered the opportunity to compare a restored and nonrestored mine over a long term. A remote 0.4-ha (one-acre) site within a nearly 650-ha managed forest tract was treated with an application of overburden and a heavy dose of animal manure; the open area of the reclaimed mine was immediately used by wildlife.

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For reclamation work at its Freedom Pit in Cattaraugus County, Lafarge North America Inc. won the Pollinator Protector of the Year Award presented at the Wildlife Habitat Council Annual Symposium in Baltimore, MD (Kauffman, 2006§[3]). The award recognized the company's efforts to create viable habitat for pollinator species, which have been in steep decline in recent decades. The DEC released a Revegetation Procedures Manual, a 91-page guide to help mine operators tailor specific planting decisions to the specific features of their site and final intended use. The manual, which is available online at URL http://www.dec. ny.gov/lands/5401.html, discusses how to minimize the adverse impacts of mining on important soil properties that affect revegetation success.

In conjunction with the DEC's MLRP, meetings were held in several parts of the State to educate contractors, students, and officials regarding mine reclamation issues. The DEC Mined Land Program staff participated in the Association of General Contractors/Department of Transportation (DOT) meeting to discuss the applicability of mined land reclamation permits in relation to DOT contracts. The same staff hosted the annual meeting of the National Association of State Land Reclamationists. Presentations included those on reclamation of the endangered Karner Blue butterfly habitat, alternative reclamation bonding instruments, and the role of landscape architects in mine reclamation. An open house, held in a Clinton County crushed stone quarry, drew 300 junior high school students who toured the facility, witnessed a blast, and examined excavating equipment. Additionally, MLP staff visited several classrooms to educate students about the mineral products they use every day.

Legislation and Government Programs

Mines on lands associated with the Native American Indian Nations continued to present challenges to the MLRP. The Oneida Nation occupies a 13-ha reservation in Madison County but owns nearly 6.900 ha throughout Madison and Oneida Counties. A claim was filed by the Oneida Indian Nation regarding a mine it owns on purchased land that is operating outside of the Mined Land Reclamation Law. In an 8-1 decision, the Supreme Court of the United States ruled that the Oneidas cannot regain sovereignty simply by purchasing the land. This mine supplies mineral products on a commercial basis to construction projects in the area. The Supreme Court ruling affects regulatory control of this mine and a sand and gravel mine in Cayuga County affected by the Cayuga Nation land claim.

The DEC continued work with the NYSGS to locate and map abandoned underground mines. Active mostly in the late 1800s to early 1900s, New York has roughly 300 such mines, each a potential danger to individuals and environmental threats caused by land subsidence and cave-ins. One of the DEC's main objectives was to publish a map of the State's underground mines on the agency's Web site to assist engineers, homeowners, and land-use planners to increase awareness of the locations and possible dangers from the State's typically long-forgotten abandoned underground mines.

The NYSGS continued bedrock and surficial geologic mapping projects in several regions of the State. Mapping priority was given to areas in which expanding development surrounding urban areas and along transportation corridors drove a need for, and understanding of, mineral resources, among other topics. The NYSGS has been an active participant in the STATEMAP program. STATEMAP is a component of the congressionally mandated National Cooperative Geological Mapping Program (NCGMP), through which the USGS distributes Federal funds to support geologic mapping efforts through a competitive funding process. The NCGMP has three primary components: (1) FEDMAP, which funds Federal geologic mapping projects, (2) STATEMAP, which is a matching-funds grant program with State geological surveys, and (3) EDMAP, a matching-funds grant program for universities with a goal to train the next generation of geologic mappers. Maps were produced at a scale of 1:24,000. In 2005, digital maps were produced of six 7 ½ minute quadrangles in New York. These included the Greenwood Lake bedrock map, the Little Falls bedrock geologic map, the Ossining surficial map, the Owasco bedrock and surficial geological maps, and the Warwick bedrock map.

Internet Reference Cited

Kauffman, V. C., 2006, Lafarge North America Inc. receives international habitat conservation award, accessed January 7, 2008, at URL http://www.wildlifehc.org/news/membernews/Index.cmf?Page=1&NewsID=29993.

[3]A reference that includes a section mark (§) is found in the Internet Reference Cited section.

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TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN NEW YORK[1, 2]

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral	2003		2004		2005	
	Quantity	Value	Quantity	Value	Quantity	Value
Clays, common	644	8,050	756	10,900	785	11,700
Gemstones	NA	65	NA	74	NA	78
Gypsum, crude	--	--	--	--	2,230	11,400
Salt	5,230	225,000	6,430	301,000	6,840	327,000
Sand and gravel, construction	30,200	172,000	33,100	189,000	31,300	204,000
Stone:						
Crushed	53,700	352,000	49,400 r	327,000 r	52,700	445,000
Dimension	65	6,110	44	4,560	42	7,470
Combined values of cement, garnet (industrial), peat, sand and gravel (industrial [2003-04]), talc (crude), wollastonite	XX	235,000	XX	256,000	XX	286,000
Total	XX	998,000	XX	1,090,000 r	XX	1,290,000

rRevised. NA Not available. XX Not applicable. -- Zero.
[1]Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2]Data are rounded to no more than three significant digits; may not add to totals shown.

TABLE 2
NEW YORK: CRUSHED STONE SOLD OR USED, BY KIND[1]

Kind	2004			2005		
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Number of quarries	Quantity (thousand metric tons)	Value (thousands)
Limestone[2]	58	30,700 r	$196,000 r	59	31,900	$267,000
Dolomite	12 r	8,380 r	62,200 r	14	10,200	86,500
Marble	1	W	W	1	W	W
Granite	7	3,850 r	20,700 r	7	3,540	28,400
Traprock	2	W	W	2	W	W
Sandstone	9	2,240 r	18,800 r	12	2,330	22,200
Slate	1	73	416	1	90	737
Miscellaneous stone	3	W	W	4	327	2,430
Total	XX	49,400 r	327,000 r	XX	52,700	445,000

rRevised. W Withheld to avoid disclosing company proprietary data; included in "Total." XX Not applicable.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes limestone-dolomite reported with no distinction between the two.

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TABLE 3
NEW YORK: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2005, BY USE[1]

(Thousand metric tons and thousand dollars)

Use	Quantity	Value
Construction:		
Coarse aggregate (+1½ inch):		
Macadam	W	W
Riprap and jetty stone	289	2,690
Filter stone	421	3,280
Other coarse aggregates	412	4,480
Total	1,120	10,400
Coarse aggregate, graded:		
Concrete aggregate, coarse	2,060	16,700
Bituminous aggregate, coarse	3,110	28,600
Bituminous surface-treatment aggregate	1,290	17,600
Railroad ballast	32	296
Other graded coarse aggregates	2,040	20,200
Total	8,530	83,500
Fine aggregate (-⅜ inch):		
Stone sand, concrete	81	650
Stone sand, bituminous mix or seal	719	5,100
Screening, undesignated	335	2,290
Other fine aggregates	1,610	16,500
Total	2,750	24,500
Coarse and fine aggragates:		
Graded road base or subbase	3,870	23,600
Unpaved road surfacing	(2)	(2)
Terrazzo and exposed aggregate	(2)	(2)
Crusher run or fill or waste	2,250	14,200
Other coarse and fine aggregates	3,780	26,400
Total	9,900	64,300
Other construction materials[3]	668	17,800
Agricultural:		
Agricultural limestone	498	3,240
Poultry grit and mineral food	(4)	(4)
Other agricultural uses	6	284
Total	504	3,520
Chemical and metallurgical, lime manufacture	(5)	(5)
Special, other fillers or extenders	(5)	(5)
Other miscellaneous uses and specified uses not listed	500	5,840
Unspecified:[6]		
Reported	11,600	95,100
Estimated	17,000	139,000
Total	28,700	235,000
Grand total	52,700	445,000

W Withheld to avoid disclosing company proprietary data; included with "Other coarse aggregates."
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Withheld to avoid disclosing company proprietary data; included in "Total."
[3]Includes drain fields.
[4]Withheld to avoid disclosing company proprietary data; included with "Other agricultural uses."
[5]Withheld to avoid disclosing company proprietary data; included in "Grand total."
[6]Reported and estimated production without a breakdown by end use.

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TABLE 4

NEW YORK: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2005, BY USE AND DISTRICT[1, 2]

(Thousand metric tons and thousand dollars)

Use	District 2		District 3		District 4	
	Quantity	Value	Quantity	Value	Quantity	Value
Construction:						
Coarse aggregate (+1½ inch)[3]	203	2,600	150	1,590	W	W
Coarse aggregate, graded[4]	W	W	2,000	15,800	W	W
Fine aggregate (-⅜ inch)[5]	W	W	1,030	9,010	222	1,380
Coarse and fine aggregates[6]	W	W	1,720	12,200	612	4,480
Other construction materials[7]	--	--	75	2,500	--	--
Agricultural[8]	W	W	W	W	W	W
Chemical and metallurgical[9]	--	--	--	--	--	--
Special[10]	--	--	--	--	--	--
Other miscellaneous uses and specified uses not listed	--	--	460	3,350	--	--
Unspecified:[11]						
Reported	8,930	73,000	--	--	--	--
Estimated	2,900	24,000	6,500	53,000	2,300	19,000
Total	14,400	127,000	12,000	98,200	4,560	45,600

	District 5		District 6		District 7	
	Quantity	Value	Quantity	Value	Quantity	Value
Construction:						
Coarse aggregate (+1½ inch)[3]	W	W	83	754	162	1,300
Coarse aggregate, graded[4]	W	W	W	W	1,080	8,750
Fine aggregate (-⅜ inch)[5]	W	W	W	W	316	2,340
Coarse and fine aggregates[6]	W	W	W	W	3,390	20,000
Other construction materials[7]	52	1,150	153	4,840	239	7,900
Agricultural[8]	W	W	--	--	10	111
Chemical and metallurgical[9]	--	--	--	--	--	--
Special[10]	W	W	--	--	--	--
Other miscellaneous uses and specified uses not listed	40	2,490	--	--	--	--
Unspecified:[11]						
Reported	1,720	14,000	--	--	979	8,000
Estimated	1,600	13,000	1,700	14,000	184	1,500
Total	5,280	44,600	5,330	41,300	6,380	50,000

	District 8	
	Quantity	Value
Construction:		
Coarse aggregate (+1½ inch)[3]	W	W
Coarse aggregate, graded[4]	W	W
Fine aggregate (-⅜ inch)[5]	W	W
Coarse and fine aggregates[6]	W	W
Other construction materials[7]	149	1,440
Agricultural[8]	W	W
Chemical and metallurgical[9]	W	W
Special[10]	--	--
Other miscellaneous uses and specified uses not listed	--	--
Unspecified:[11]		
Reported	--	--
Estimated	1,900	15,000
Total	4,660	38,300

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]No crushed stone produced in District 1.

[3]Includes filter stone, macadam, riprap and jetty stone, and other coarse aggregates.

[4]Includes bituminous aggregate (coarse), bituminous surface-treatment aggregate, concrete aggregate (coarse), railroad ballast, and other graded coarse aggregates.

[5]Includes screening (undesignated), stone sand (concrete), stone sand bituminous mix or seal, and other fine aggregates.

[6]Includes crusher run or fill or waste, graded road base or subbase, terrazzo and exposed aggregate, unpaved road surfacing, and other coarse and fine aggregates.

[7]Includes drain fields.

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TABLE 4--Continued
NEW YORK: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2005, BY USE AND DISTRICT[1,2]

[8]Includes agricultural limestone, poultry grit and mineral food, and other agricultural uses.
[9]Includes lime manufacture.
[10]Includes other fillers or extenders.
[11]Reported and estimated production without a breakdown by end use.

TABLE 5
NEW YORK: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2005,
BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	6,890	$54,800	$7.95
Plaster and gunite sands	184	1,380	7.49
Concrete products (blocks, bricks, pipe, decorative, etc.)	191	2,020	10.59
Asphaltic concrete aggregates and other bituminous mixtures	2,310	15,400	6.66
Road base and coverings	4,360	23,300	5.34
Road stabilization (cement and lime)	414	2,500	6.04
Fill	1,950	7,810	4.00
Snow and ice control	1,210	5,520	4.56
Railroad ballast	15	63	4.20
Filtration	103	774	7.51
Other miscellaneous uses	244	1,970	8.09
Unspecified:[2]			
Reported	4,220	30,800	7.31
Estimated	9,200	57,200	6.22
Total or average	31,300	204,000	6.50

[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.
[2]Reported and estimated production without a breakdown by end use.

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TABLE 6
NEW YORK: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2005,
BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregates and concrete products[2]	2,470	22,500	510	6,490	700	5,920
Asphaltic concrete aggregates and other bituminous mixtures	--	--	31	436	600	4,450
Road base and coverings[3]	W	W	146	1,150	W	W
Fill	163	1,480	115	527	693	2,270
Snow and ice control	W	W	26	363	337	2,000
Other miscellaneous uses[4]	58	634	6	197	1,140	6,310
Unspecified:[5]						
Reported	258	4,310	1,360	10,600	33	177
Estimated	500	3,200	1,800	11,200	400	2,800
Total	3,460	32,100	3,980	31,000	3,940	23,900

	District 4		District 5		District 6	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregates and concrete products[2]	659	2,720	240	1,580	1,340	9,610
Asphaltic concrete aggregates and other bituminous mixtures	157	791	W	W	939	5,980
Road base and coverings[3]	269	1,100	322	2,110	1,940	10,200
Fill	450	1,360	151	436	196	919
Snow and ice control	315	1,190	W	W	197	685
Other miscellaneous uses[4]	3	32	148	577	142	1,070
Unspecified:[5]						
Reported	7	42	11	68	514	3,530
Estimated	1,500	9,100	500	3,000	1,400	8,500
Total	3,320	16,300	1,360	7,780	6,620	40,500

	District 7		District 8	
	Quantity	Value	Quantity	Value
Concrete aggregates and concrete products[2]	706	4,870	649	4,490
Asphaltic concrete aggregates and other bituminous mixtures	194	971	W	W
Road base and coverings[3]	690	2,950	277	1,760
Fill	113	471	70	350
Snow and ice control	101	393	W	W
Other miscellaneous uses[4]	24	163	608	4,070
Unspecified:[5]				
Reported	318	1,980	1,720	10,100
Estimated	2,200	13,600	900	5,800
Total	4,350	25,400	4,250	26,500

W Withheld to avoid disclosing company proprietary data; included in "Other miscellaneous uses." -- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes plaster and gunite sands.

[3]Includes road and other stabilization (cement and lime).

[4]Includes filtration and railroad ballast.

[5]Reported and estimated production without a breakdown by end use.

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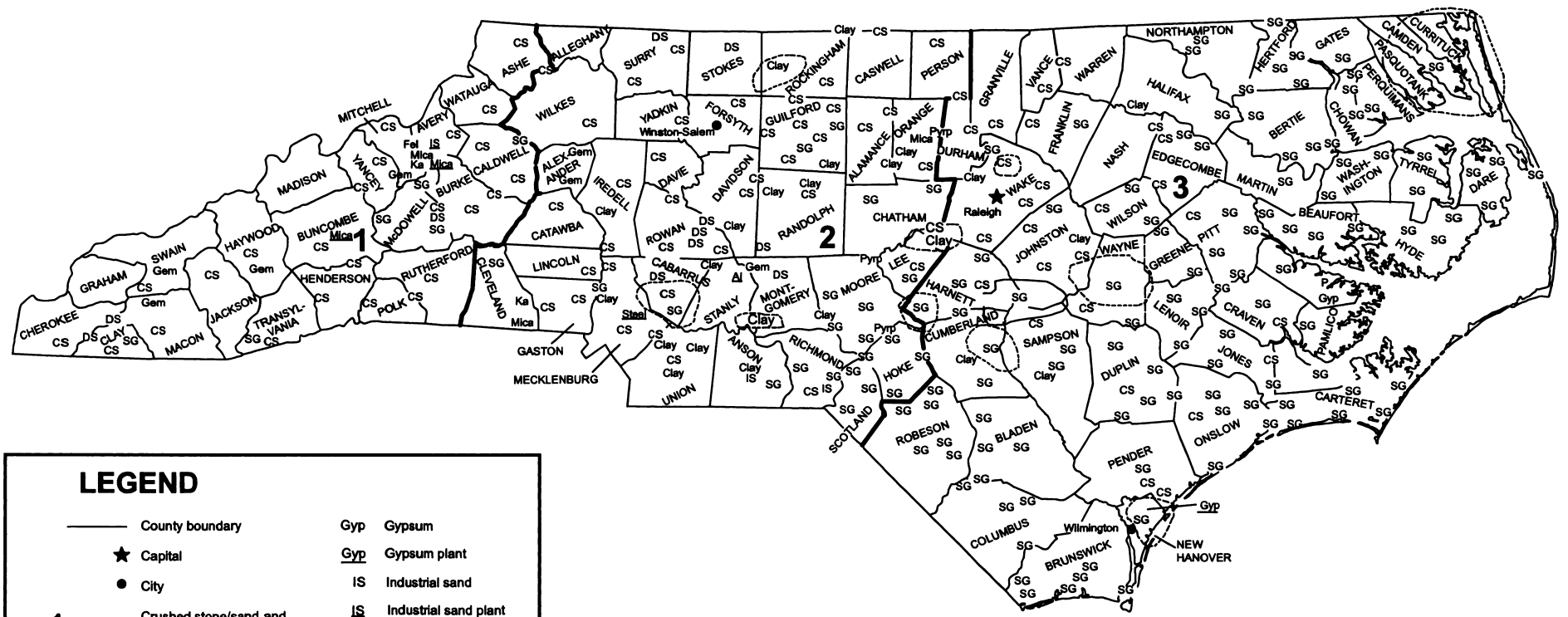
NORTH CAROLINA



LEGEND

County boundary	Gyp — Gypsum
★ Capital	Gyp — Gypsum plant
● City	IS — Industrial sand
1 — Crushed stone/sand and gravel districts	IS — Industrial sand plant
	Ka — Kaolin
MINERAL SYMBOLS (Major producing areas)	Mica — Mica
	Mica — Mica plant
Al — Aluminum plant	P — Phosphate rock
Clay — Common clay	Pyrp — Pyrophyllite
CS — Crushed stone	SG — Construction sand and gravel
DS — Dimension stone	Steel — Steel plant
Fel — Feldspar	Concentration of mineral operations
Gem — Gemstones	

Source: North Carolina Geological Survey/U.S. Geological Survey (2005)

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THE MINERAL INDUSTRY OF NORTH CAROLINA

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the North Carolina Geological Survey for collecting information on all nonfuel minerals.

In 2005, North Carolina's nonfuel raw mineral production was valued[1] at $792 million,[2] based upon annual U.S. Geological Survey (USGS) data. This was a 1.6% decrease from that of 2004[3] and followed a 9.7% increase from 2003 to 2004. The State was 25th in rank[3] (21st in 2004) among the 50 States in total nonfuel mineral production value, of which North Carolina accounted for nearly 1.5% of the U.S. total.

Crushed stone remained North Carolina's leading nonfuel raw mineral in 2005, accounting for about 81% of the State's total value of nonfuel raw mineral production (excluding that of phosphate rock). It was followed by phosphate rock, construction sand and gravel, industrial sand and gravel, feldspar, dimension stone, common clays, and mica. The largest increases in value for the year were in crushed stone, up $89 million, and in phosphate rock. Smaller yet significant increases in value also took place in common clays, construction sand and gravel, mica, and pyrophyllite. Although industrial sand and gravel production was down about 29%, its value of production was up slightly. The largest decreases in value were those of feldspar and dimension stone, down $1.5 million and $1.2 million, respectively (table 1).

In 2005, North Carolina continued to be the only State that produced pyrophyllite, to lead the Nation in the quantities of feldspar and mica produced, to be 9th in crushed stone production and 10th in dimension stone, and to be 11th in gemstones (based upon value). While the State rose to 2d from 3d of four phosphate rock-producing States, it decreased to 3d from 1st in common clays, and to 10th from 7th in industrial sand and gravel. Additionally, significant quantities of construction sand and gravel were produced in North Carolina. Metal production in the State, especially that of primary aluminum and raw steel, resulted from the processing of recycled materials or raw materials received from other domestic and foreign sources.

[1]The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2005 USGS mineral production data published in this chapter are those available as of December 2006. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—can be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

[2]The State's actual annual total value for 2005 is significantly higher than $792 million, also listed as such in table 1 from which specific data for phosphate rock and pyrophyllite (2005) were withheld (company proprietary data).

[3]If computed while also withholding "Combined values" from 2004 as well, instead of a decrease, the State would have a more than 10% increase in value in 2005 from 2004; this better represents the true change in value for the State's nonfuel mineral industry from 2004 to 2005. Inclusion of the withheld 2005 combined value data would also change the State's overall ranking for 2005 to 22d or 21st.

The following narrative information was provided by the North Carolina Geological Survey[4] (NCGS).

Commodity Review

Industrial Minerals

Clays.—Resco Products Inc. announced the successful installation and startup of a roller hearth kiln in the company's Greensboro, NC, facility. Resco manufactures brick of several types and classes for a variety of applications including high-alumina brick containing greater than 45% alumina (Resco Products Inc., 2005§[5]).

Crushed Stone.—Martin Marietta Materials, Inc., based in Raleigh, continued with its multiyear investment project of installing new state-of-the-art technology to run its rock-crushing facilities for its quarries. The Sunrock Group's Butner quarry in Granville County switched from a wet to a dry fines-recovery process resulting in a significant decrease in handling fines and in the production (from crushed stone) of manufactured sand for the company's asphalt plant and high fines density sand for its concrete plant (Kuhar, 2005§).

Mica.—Oglebay Norton Co. announced on April 6, 2005, that its Oglebay North Specialty Minerals, Inc. subsidiary completed the sale of its Kings Mountain mica operation to King's Mountain Mining LLC, an affiliate of Zemex Corp., for $15,000,000 (Oglebay Norton Company, 2005§).

Environmental Issues, Mine Safety, and Technology Achievements

The Federal Clean Air Act of 2002 required utility companies burning high-sulfur coal and releasing sulfur dioxide into the atmosphere to reduce their sulfur dioxide emissions. As a result, utility companies have formed partnerships with wallboard companies to convert sulfur dioxide through the flue-gas desulferization process into synthetic gypsum, which then in turn can be used in the manufacture of wallboard. In the past, that synthetic gypsum would have been sent to landfills as a combustion byproduct from the burning of coal. North Carolina's two major electric utilities, Progress Energy, Inc. and Duke Energy Corp., planned to sell byproduct gypsum rather than sending the materials to a landfill.

In early December, Progress Energy officials and State and local leaders joined in a celebration of the State's first new

[4]Jeffrey C. Reid, Senior Geologist, Minerals and Geographic Information Systems, authored the text for the State mineral industry information provided by the North Carolina Geological Survey.

[5]References that include a section mark (§) are included in the Internet References Cited section.

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scrubber (flue-gas desulferization unit) to begin operation under North Carolina's Clean Smokestacks Act (passed by the North Carolina General Assembly in 2002); the Ashville plant scrubber began operating on November 17 (Progress Energy Inc., 2005§).

National Gypsum Co. announced on August 3, 2005, plans to invest up to $125 million to construct a new high-speed wallboard plant west of Charlotte in Mount Holly. The plant will create 100 direct jobs and 100 indirect jobs for Gaston County (National Gypsum Company, 2005§).

PCS Phosphate Co.'s Aurora operations reached a milestone of 'One Million Safe Hours' worked on July 27, 2005. Also, PCS employees actively participated in the Science Olympiad by beginning an educational outreach program, "I Dig Aurora," in collaboration with the Aurora Fossil Museum, in Aurora. [The Science Olympiad is an international nonprofit organization devoted to improving the quality of science education, increasing student interest in science, and providing recognition for outstanding achievement in science education by both students and teachers (Science Olympiad, 2007§).] Additional information regarding the Aurora Fossil Museum may be found on the Internet at URL http://www.aurorafossilmuseum.com.

Legislation and Government Programs

A listing of permitted active and inactive mines in North Carolina (as of December 31, 2005) was prepared by the NCGS and was made available on the Internet (North Carolina Geological Survey, 2006§).

The NCGS in collaboration with the minerals industry and the Minerals Research Laboratory of North Carolina convened the 42nd Forum on the Geology of Industrial Minerals in Asheville on May 7-13, 2006. The Forum proceedings were electronically published by the NCGS as Information Circular 34 in a compact disk and was available for purchase by way of the Internet (Reid, 2006).

The Minerals Research Laboratory (MRL), which is in Asheville, is a part of the North Carolina State University's Industrial Extension Service. The main research focus of the MRL is the beneficiation of industrial minerals; it is fairly unique in that it partners with academia, government, and industry in conducting effective research. Although most of its research efforts are conducted for corporate sponsors, public service projects also are undertaken. The MRL's facility is equipped with mineral processing equipment and an analytical support facility for mineral characterization. As part of a Land Grant Institution, technical assistance and service to the public is also part of the MRL mission. The MRL continued efforts to communicate to the general public its purpose and information about its activities by establishing an educational outreach program known as "Down to Earth." Also, at its facilities in Asheville, the MRL sponsors professional seminars, which count toward continuing professional competency requirements for professional engineers. The MRL library contains some of the most extensive reference sources for mineral processing information in the southeastern United States, which also is available for public use. Additional information regarding the MRL may be found at the lab's Web site, URL http://www.engr.ncsu.edu/mrl/.

Recent MRL work includes projects on lightweight aggregate and providing assistance to the NCGS studies regarding garnet, high purity quartz, glass sand, and frac sand products. Results of these studies are included in the aforementioned NCGS Information Circular 34. The MRL has conducted diverse beneficiation studies for companies located in North Carolina, as well as similar studies for new mines worldwide, including studies to improve the quality and efficiency of existing products. The MRL director traveled to various States to assist mining companies at their sites and to advise them of potential opportunities learned of as of a result of the lab's collaborative research studies.

The North Carolina General Assembly funded a 3-year Landslide Hazard Mapping Program with $1.3 million from the State's Hurricane Recovery Act of 2005. The NCGS is implementing this program. The Act provided disaster assistance to people, businesses, and public agencies that suffered damage from one or more of the six hurricanes that struck North Carolina in 2004. On September 16, 2004, heavy rains from Hurricane Ivan triggered a landslide that carried massive amounts of debris more than 3 kilometers, killing five people and destroying 16 homes in the Peeks Creek community of Macon County, NC. A week earlier, Hurricane Ivan and Hurricane Francis started more than 140 other landslides throughout western North Carolina (Office of the Governor, 2006§).

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TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN NORTH CAROLINA[1, 2]

(Thousand metric tons and thousand dollars)

Mineral	2003		2004		2005	
	Quantity	Value	Quantity	Value	Quantity	Value
Clays:						
Common	2,190	10,900	2,260	12,900	2,180	13,900
Kaolin	W	4,500	34	764	27	593
Feldspar	362	18,900	351	20,500	351	19,000
Gemstones	NA	279	NA	280	NA	280
Mica, crude	39	9,580	40	9,600	39	10,200
Sand and gravel:						
Construction	10,500	55,600	11,500	59,700	12,000	63,900
Industrial	1,530	26,700	1,630	29,000	1,150	29,200
Stone:						
Crushed	67,100	505,000	72,300	549,000 r	74,300	638,000
Dimension	47	18,700	43	18,200	39	17,000
Combined values of olivine (2003-04), phosphate rock, pyrophyllite (crude)	XX	84,500	XX	105,000	XX	(3)
Total	XX	734,000	XX	805,000	XX	792,000

rRevised. NA Not available. W Withheld to avoid disclosing company proprietary data. XX Not applicable.
[1]Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2]Data are rounded to no more than three significant digits; may not add to totals shown.
[3]Value excluded to avoid disclosing company proprietary data.

TABLE 2
NORTH CAROLINA: CRUSHED STONE SOLD OR USED, BY KIND[1]

Kind	2004			2005		
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Number of quarries	Quantity (thousand metric tons)	Value (thousands)
Limestone	11	6,670	$48,800	11	6,790	$49,700
Dolomite	1	W	W	1	W	W
Calcareous marl	1	W	W	--	--	--
Granite	76 r	52,500 r	400,000 r	74	53,900	472,000
Traprock	7	7,280	53,500	7	7,690	62,400
Quartzite	2	W	W	2	W	W
Slate	2	1,320	9,460	2	1,350	9,700
Miscellaneous stone	4 r	3,270 r	25,600 r	4	3,460	33,500
Total	XX	72,300	549,000 r	XX	74,300	638,000

rRevised. W Withheld to avoid disclosing company proprietary data; included in "Total." XX Not applicable. -- Zero.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.

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TABLE 3

NORTH CAROLINA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2005, BY USE[1]

(Thousand metric tons and thousand dollars)

Use	Quantity	Value
Construction:		
Coarse aggregate (+1½ inch):		
Macadam	W	W
Riprap and jetty stone	770	10,900
Filter stone	173	2,420
Other coarse aggregates	353	1,760
Total	1,300	15,100
Coarse aggregate, graded:		
Concrete aggregate, coarse	3,590	45,200
Bituminous aggregate, coarse	(2)	(2)
Bituminous surface-treatment aggregate	(2)	(2)
Railroad ballast	1,300	9,080
Other graded coarse aggregates	3,220	36,600
Total	11,100	125,000
Fine aggregate (-⅜ inch):		
Stone sand, concrete	588	5,600
Stone sand, bituminous mix or seal	(3)	(3)
Screening, undesignated	2,210	18,000
Other fine aggregates	1,020	9,200
Total	3,820	32,900
Coarse and fine aggregates:		
Graded road base or subbase	7,050	63,300
Unpaved road surfacing	150	2,020
Terrazzo and exposed aggregate	(2)	(2)
Crusher run or fill or waste	924	7,770
Roofing granules	(2)	(2)
Other coarse and fine aggregates	2,210	16,700
Total	10,400	90,100
Other construction materials	(4)	(4)
Agricultural, poultry grit and mineral food	(4)	(4)
Unspecified:[5]		
Reported	42,700	327,000
Estimated	4,200	42,000
Total	46,900	369,000
Grand total	74,300	638,000

W Withheld to avoid disclosing company proprietary data; included with "Other coarse aggregates."

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Withheld to avoid disclosing company proprietary data; included in "Total."

[3]Withheld to avoid disclosing company proprietary data; included with "Other fine aggregates."

[4]Withheld to avoid disclosing company proprietary data; included in "Grand total."

[5]Reported and estimated production without a breakdown by end use.

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TABLE 4
NORTH CAROLINA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2005, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Construction:						
Coarse aggregate (+1½ inch)[2]	W	W	W	W	W	W
Coarse aggregate, graded[3]	W	W	W	W	W	W
Fine aggregate (-⅜ inch)[4]	W	W	W	W	W	W
Coarse and fine aggregate[5]	2,370	21,700	W	W	W	W
Other construction materials	--	--	W	W	--	--
Agricultural[6]	--	--	W	W	W	W
Unspecified:[7]						
Reported	4,120	36,700	21,600	148,000	17,000	142,000
Estimated	2,600	26,000	174	1,700	1,400	14,000
Total	13,200	127,000	37,200	296,000	23,900	215,000

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes filter stone, macadam, riprap and jetty stone, and other coarse aggregates.

[3]Includes bituminous aggregate (coarse), bituminous surface-treatment aggregate, concrete aggregate (coarse), railroad ballast, and other graded coarse aggregates.

[4]Includes screening (undesignated), stone sand bituminous mix or seal, stone sand (concrete), and other fine aggregates.

[5]Includes crusher run or fill or waste, graded road base or subbase, terrazzo and exposed aggregate, unpaved road surfacing, roofing granules, and other coarse and fine aggregates.

[6]Includes poultry grit and mineral food.

[7]Reported and estimated production without a breakdown by end use.

TABLE 5
NORTH CAROLINA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2005, BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	4,810	$24,100	$5.01
Plaster and gunite sands	108	842	7.80
Concrete products (blocks, bricks, pipe, decorative, etc.)	358	2,750	7.69
Asphaltic concrete aggregates and other bituminous mixtures	474	2,590	5.47
Road base and coverings[2]	460	3,330	7.24
Fill	2,610	9,360	3.59
Snow and ice control	18	120	6.67
Other miscellaneous uses	216	3,630	16.81
Unspecified:[3]			
Reported	1,180	7,620	6.45
Estimated	1,700	9,600	5.51
Total or average	12,000	63,900	5.34

[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

[2]Includes road and other stabilization (lime).

[3]Reported and estimated production without a breakdown by end use.

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TABLE 6
NORTH CAROLINA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2005,
BY USE AND DISTRICT[1, 2]

(Thousand metric tons and thousand dollars)

Use	Districts 1 and 2		District 3		Unspecified districts	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregates and concrete products[3]	2,330	12,900	2,930	14,600	22	255
Asphaltic concrete aggregates and road base materials[4]	719	5,240	215	688	--	--
Fill	230	676	2,320	8,360	61	325
Other miscellaneous uses[5]	204	3,520	30	234	--	--
Unspecified:[6]						
Reported	973	6,020	208	1,610	--	--
Estimated	100	600	1,600	9,000	--	--
Total	4,570	29,000	7,320	34,400	83	580

-- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Districts 1 and 2 are combined to avoid disclosing company proprietary data.

[3]Includes plaster and gunite sands.

[4]Includes road and other stabilization (lime).

[5]Includes snow and ice control.

[6]Reported and estimated production without a breakdown by end use.

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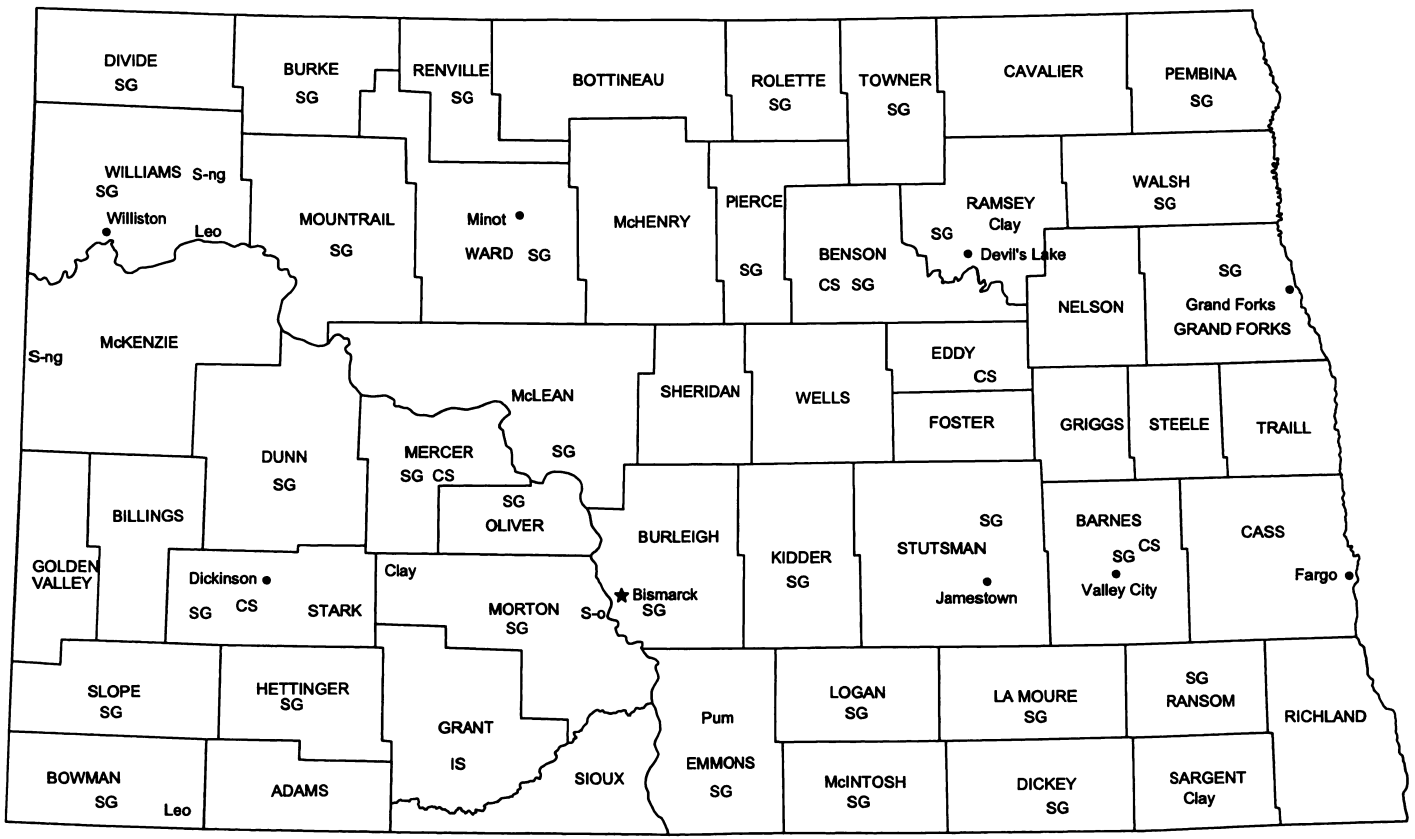
NORTH DAKOTA



LEGEND

- County boundary
- ★ Capital
- • City

MINERAL SYMBOLS
(Major producing areas)

Clay	Common clay
CS	Crushed stone
IS	Industrial sand
Leo	Leonardite
Pum	Pumicite
S-ng	Sulfur (natural gas)
S-o	Sulfur (oil)
SG	Construction sand and gravel

0 50 Kilometers

Source: North Dakota Geological Survey/U.S. Geological Survey (2005)

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THE MINERAL INDUSTRY OF NORTH DAKOTA

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the North Dakota Geological Survey for collecting information on all nonfuel minerals.

In 2005, North Dakota's nonfuel raw mineral production was valued[1] at $45.6 million, based upon annual U.S. Geological Survey (USGS) data. This was a 2.9% increase from the State's total nonfuel mineral value for 2004, which was down 4.7% from that of 2003.

North Dakota's leading nonfuel mineral by value in 2005 continued to be construction sand and gravel, of which the State continued to produce significant quantities. This high-volume, low value commodity accounted for more than three-fourths of the State's nonfuel raw mineral production value. Lime was second by value, and crushed stone was third. In 2005, although construction sand and gravel production was down nearly 3.5%, the commodity's overall value rose slightly more than 5%, up $1.7 million, accounting for most of the State's increase in value for the year. The only decrease in value took place in crushed stone (company proprietary data); except for gemstones, the value of which remained unchanged, the State's other nonfuel minerals values rose slightly (table 1).

The following narrative information was provided by the North Dakota Geological Survey[2] (NDGS). Production data in the text that follows are those reported by the NDGS based upon that agency's own surveys and estimates.

Commodity Review

Industrial Minerals

During 2005, 15 surface mining operators in North Dakota reported information to the State Soil Conservation Committee (SSCC). The SSCC collects production data by volume, unlike the USGS, which collects data by mass or metric tons produced. Based on these reports, 97 hectares (ha) were affected. The quantity of minerals mined included 1,757,000 cubic meters (m^3) of sand and gravel, 59,000 m^3 of clay, 25,000 m^3 of scoria, and 24,000 m^3 of crushed stone totaling 1,870,000 m^3 of mineral material. From 55 pits, ranging in size from more than 0.1 ha to 8 ha, a total of 525,000 m^3 of overburden was disturbed.

Common clays.—All of the clay mined in the State during this period was mined by the Hebron Brick Co. to produce brick. One-third to one-half of the clay mined for the manufacturer of brick was kaolinite.

Leonardite.—Leonardite is an oxidized lignite. Currently, Georesources, Inc. of Williston and American Colloid Co. of Scranton are the only leonardite mining operations in North Dakota, although the companies mining lignite routinely encounter leonardite. The two companies produced a combined total of approximately 78,000 metric tons (t) of leonardite in 2005, a 23% increase from 2004. Leonardite is processed and used as a dispersant and viscosity control in oil well drilling muds, as a stabilizer for ion-exchange resins in water treatment, and as a soil conditioner.

Pumice and Pumicite.—Volcanic ash (pumicite) has been mined intermittently from the Linton area since 1970. In 2005, less than 100 t was mined by NURTURE, Inc., a Minneapolis-based company that produces and distributes a growing line of volcanic ash-base products. The NDGS recently determined this deposit contains one billion tons of pumicite.

Legislation and Government Programs

The SSCC, as designated by the State legislature, continues to administer the Surface Mining Report Law, which required any person conducting surface mining operations for minerals other than coal to comply with the reporting requirements of North Dakota Century Code Chapter 38-16. Minerals included under the law are cement rock, clay, gravel, limestone, manganese, molybdenum, peat, potash, pumicite, salt, sand, scoria, stone, sodium sulfate, zeolite, or other minerals except coal. The SSCC has the regulatory authority to administer the reporting requirement, while the actual regulatory authority for most of these mining activities rests with the North Dakota Department of Mineral Resources. The law requires that any person or company that within one calendar year removes 7,650 m^3 (10,000 cubic yards) or more of earthen materials or products (including overburden) affecting 0.2 ha (one-half acre) or more in combined mining operations must report the particulars of their surface mining activities. Some operators of smaller operations cooperate by voluntarily submitting summary reports to the SSCC, although not required to by law. Nevertheless, because not all operations report, the summary of surface mining statistics presented above is a conservative estimate of the amount of nonfuel minerals mined in North Dakota in 2005.

Information about North Dakota's nonfuel mineral resources, as well as fuel minerals and uranium, is available on the minerals page of the NDGS Web site at URL https://www.dmr.nd.gov/ndgs/.

[1]The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2005 USGS mineral production data published in this chapter are those available as of December 2006. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—can be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

[2]Edward C. Murphy, State Geologist, authored the text of State mineral industry information provided by the North Dakota Geological Survey.

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TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN NORTH DAKOTA[1, 2]

(Thousand metric tons and thousand dollars)

Mineral	2003		2004		2005	
	Quantity	Value	Quantity	Value	Quantity	Value
Clays, common	W	W	W	186	76	W
Gemstones	NA	4	NA	4	NA	4
Sand and gravel, construction	13,500	35,900	11,700	32,800	11,300	34,500
Stone, crushed	W	W	W	W	89	396
Combined values of lime, sand and gravel (industrial), stone [crushed limestone, volcanic cinder, and miscellaneous (2003), crushed granite, traprock, volcanic cinder, miscellaneous (2004)], and values indicated by symbol W	XX	10,600	XX	11,300 r	XX	10,800
Total	XX	46,500	XX	44,300 r	XX	45,600

rRevised. NA Not available. W Withheld to avoid disclosing company proprietary data. Withheld values included in "Combined values" data. XX Not applicable.
[1]Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2]Data are rounded to no more than three significant digits; may not add to totals shown.

TABLE 2
NORTH DAKOTA: CRUSHED STONE SOLD OR USED, BY KIND

Kind	2004			2005		
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Number of quarries	Quantity (thousand metric tons)	Value (thousands)
Granite	1	W	W	1	23	$103
Traprock	1	W	W	1	10	43
Volcanic cinder and scoria	1	W	W	1	42	186
Miscellaneous stone	3 r	W	W	1	14	64
Total	XX	W	W	XX	89	396

rRevised. W Withheld to avoid disclosing company proprietary data. XX Not applicable.

TABLE 3
NORTH DAKOTA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2005, BY USE[1]

(Thousand metric tons and thousand dollars)

Use	Quantity	Value
Construction, Coarse aggregate, graded, concrete aggregate (coarse)	9	$43
Unspecified, reported[2]	80	353
Total	89	396

[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Reported production without a breakdown by end use.

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TABLE 4
NORTH DAKOTA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2005,
BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	111	$778	$7.01
Asphaltic concrete aggregates and other bituminous mixtures	795	2,650	3.33
Road base and coverings	2,930	9,510	3.24
Road stabilization (cement)	21	35	1.67
Fill	210	433	2.06
Snow and ice control	8	22	2.75
Railroad ballast	9	65	7.22
Unspecified:[2]			
Reported	2,650	7,730	2.92
Estimated	4,500	13,300	2.92
Total or average	11,300	34,500	3.06

[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Reported and estimated production without a breakdown by end use.

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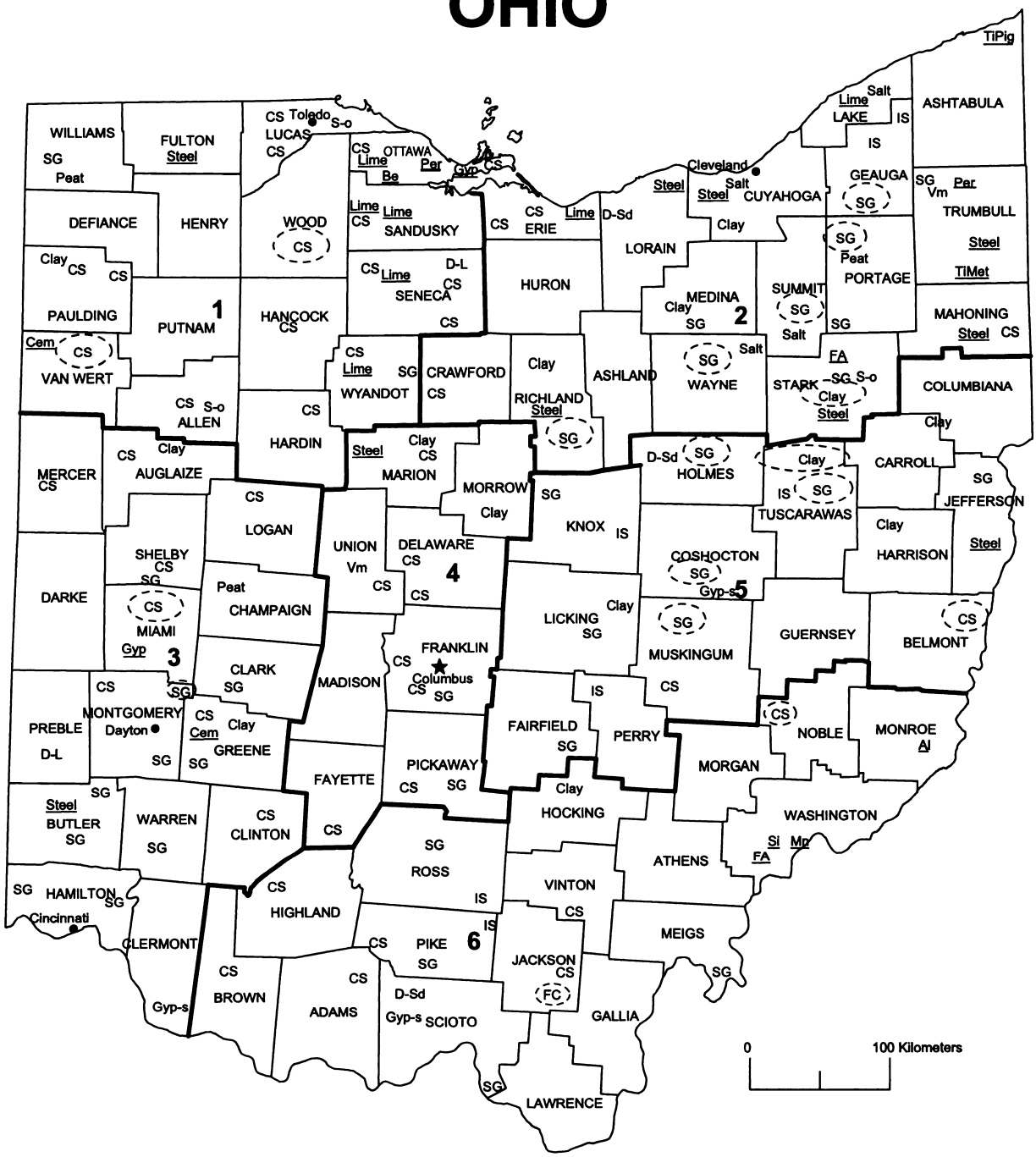
OHIO



LEGEND

- County boundary
- Capital
- City
- 1 Crushed stone/sand and gravel districts

MINERAL SYMBOLS (Major Producing areas)

Al	Aluminum plant
Be	Beryllium plant
Cem	Cement plant
Clay	Common clay
CS	Crushed stone
D-L	Dimension limestone
D-Sd	Dimension sandstone
FA	Ferroalloys plant
FC	Fire clay
Gyp	Gypsum
Gyp-s	Synthetic gypsum
IS	Industrial sand
Lime	Lime plant
Mn	Manganese plant
Peat	Peat
Per	Perlite plant
S-o	Sulfur (oil)
Salt	Salt
SG	Construction sand and gravel
Si	Silicon metal plant
Steel	Steel plant
TiPig	Titanium pigment plant
Vm	Vermiculite
	Concentration of mineral operations

Source: Ohio Division of Geological Survey/U.S. Geological Survey (2005)

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THE MINERAL INDUSTRY OF OHIO

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Ohio Department of Natural Resources, Division of Geological Survey, for collecting information on all nonfuel minerals.

In 2005, Ohio's nonfuel raw mineral production was valued[1] at $1.21 billion, based upon annual U.S. Geological Survey (USGS) data. This was a nearly 7.1% increase from the State's total nonfuel mineral value for 2004, which was up 11.9% from that of 2003. The State was 17th in rank (virtually tied for 16th and down from 13th in 2004) among the 50 States in total nonfuel raw mineral production value and accounted for more than 2% of the U.S. total value.

Crushed stone by value remained Ohio's leading nonfuel mineral, followed by construction sand and gravel, salt, lime, cement (portland and masonry), and industrial sand and gravel (in descending order of value). Crushed stone and construction sand and gravel accounted for nearly 60% of the State's total nonfuel mineral value. A majority of the State's mineral commodities rose in value in 2005, led by the increases of crushed stone and construction sand and gravel. Although crushed stone production dropped slightly, down about 1.7%, its value rose by $42 million, up 10.6%. Construction sand and gravel, with an increase in production of 1.7%, rose in value by $25 million, up 9.5%. Industrial sand and gravel and portland cement followed with increases of about $3.5 million each; lime value was up $3 million; and the value of salt was up by about $2 million. Relative to these increases, all decreases in commodity values (common clay, dimension stone, masonry cement, and peat) were small (table 1).

In 2005, Ohio continued to rank second among three fire clay-producing States, fourth in the quantities of salt produced, as well as fourth in that of lime, and fifth in the production of common clays. As the State increased to 9th from 10th in the production of industrial sand and gravel, it decreased to 7th from 6th in construction sand and gravel and to 8th from 6th in the production of crushed stone. Additionally, significant quantities of cement and dimension stone were produced in the State.

Ohio's mines only produced industrial minerals and coal; metals produced in the State, including aluminum, beryllium, ferroalloys, raw steel, and silicon, were processed from materials received from foreign and other domestic sources. In 2005, the State continued to be the Nation's second leading raw steel-manufacturing State with an estimated output of about 14.9 million metric tons (Mt), up 4.2% from 14.3 Mt that were produced in 2004, as reported by the American Iron and Steel Institute (American Iron and Steel Institute, 2006, p. 74). With a significant decrease in the production, Ohio decreased to 12th from 10th in the production of primary aluminum.

The Ohio Department of Natural Resources, Division of Geological Survey[2] (ODGS), provided the following narrative information, based upon its own surveys, estimates, and data that it acquired from other State agencies. In 2005, industrial minerals were produced in 87 of Ohio's 88 counties. Based upon ODGS surveys and estimates, Ohio's total combined nonfuel mineral production during 2005 was 127.6 Mt, a 3.0% decrease from that of 2004; the total value of industrial minerals produced in Ohio during 2005, not including cement or gemstones, was $900 million. The Ohio nonfuel mineral industry employed more than 5,300 people during 2005; wages for all employees at industrial mineral operations totaled nearly $428 million.

Commodity Review

Industrial Minerals

Common Clays.—Clay and shale production in 2005 moderated somewhat from that of 2004. Belden Brick Co. was the largest producer of building brick in the State; the company's seven plants in Tuscarawas County had the capacity to produce 225 million bricks per year. Several other operators produced millions of additional bricks at plants located in the counties of Columbiana, Harrison, Licking, Marion, and Richland. Large quantities of Ohio clay and shale continued to be used in cement manufacture and lightweight-aggregate applications. Stone Creek Brick Co. discontinued operations late in 2004.

Construction Sand and Gravel.—Sand and gravel was sold or produced in 64 counties in 2005 by 210 companies at 292 active operations, the majority of which were small to medium in size and served local markets. The largest sand and gravel operation was Olen Corp.'s Columbus Plant, which produced 2.1 Mt of aggregate from glacial outwash and kame terraces in southern Franklin County. Three other operations located in Butler County and Stark County produced more than 1 Mt each during 2005, and 22 additional pits, located throughout the State, each produced more than 500,000 metric tons (t) of sand and gravel. Martin Marietta Aggregates, again, led the State overall producing nearly 8.1 Mt of sand and gravel from its 13 operations throughout the State; Shelly Materials, Inc. was the State's second largest producing company with a total of nearly 4.9 Mt of sand and gravel from its 12 operations (Ohio Division of Geological Survey, 2006a§[3]).

Crushed Stone.—Ohio's 112 active stone quarries produced 72.1 Mt of limestone and dolomite in 2005. The State's single

[1]The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2005 USGS mineral production data published in this chapter are those available as of December 2006. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—can be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

[2]Mark E. Wolfe, a Senior Geologist with the Ohio Division of Geological Survey, authored the text of the State mineral industry information provided by that State agency.

[3]References that include a section mark (§) are included in the Internet References Cited section.

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most productive limestone quarry was the Delaware Quarry (in Delaware County), operated by National Lime and Stone Co. This quarry produced 4.4 Mt of aggregate from the Devonian-age Columbus Limestone and Silurian-age Salina Dolomite. National Lime and Stone also continued to lead the State in limestone and dolomite production with an overall production of more than 13 Mt from 10 separate plant operations. Hanson Aggregates Midwest, Inc. and Shelly Materials, Inc. were the second and third largest producing companies with production of 11.3 Mt and 10.6 Mt of stone, respectively. These two companies also had the next largest single quarry operations in the State. In 2005, from Shelly Materials' Columbus Limestone #331 nearly 4 Mt of stone was produced, and Hanson Aggregates' Sandusky Quarry (Erie County) produced 3.29 Mt of stone. The primary use for crushed and broken limestone and dolomite in the State was road construction and resurfacing; other major uses included various stone products for asphaltic concrete and portland cement concrete, commercial building, and for the production of lime (Ohio Division of Geological Survey, 2005§; 2006a§).

During 2005, East Fairfield Coal Co. began construction of a second underground limestone mine in Mahoning County.

Dimension Stone.—Based upon ODGS surveys and estimates, production of Ohio dimension sandstone, limestone, and dolomite increased more than 35% from that of 2004; sales of dimension sandstone rose 27% in 2005 from that of 2004 (Ohio Division of Geological Survey, 2005§; 2006a§). Demand remained strong for institutional and residential projects in Ohio and from outside of the State. Large stone supply companies in the State obtained rough stone from the State's quarries and then cut it to meet customer specifications.

Gypsum.—Ohio's lone remaining gypsum quarry, K West Group LLC's Port Clinton quarry in Ottawa County, flooded in 2004, and was permanently abandoned in 2005. Minor amounts of gypsum were sold in 2005 from existing stockpiles.

Industrial Sand and Gravel.—Ohio has an abundance of high-silica sandstones that can be used for glass manufacture and other industrial applications. During 2005, Best Sand Corp. produced 693,000 t of industrial sand from the Pennsylvanian-age Sharon conglomerate, located in Geauga County. Ogleby Norton Industrial Sands, Inc. produced more than 368,000 t of high-silica sand from operations in Knox County and Perry County. Production came from the Mississippian-age Black Hand Sandstone and Pennsylvanian-age Massillon Sandstone, respectively.

Salt.—Salt was produced by three companies at five operations in five Ohio counties during 2005. Reported known production of salt for the year was nearly 4.48 Mt. Two large underground mines (located mostly beneath Lake Erie), one each in Cuyahoga County and Lake County, produced rock salt at a record level with the company's sales for 2005 (including stocks) totaling about 4.0 Mt. These two mines, Cargill Inc., Cargill Salt Division, and Morton International, Inc., Morton Salt Division, were the major salt producers in Ohio during 2005. Three brining operations, one each in Licking, Summit, and Wayne Counties, sold a total of 8,800 t of salt in brine and about 703,000 t of evaporated salt (Ohio Division of Geological Survey, 2006a§).

Government Programs

The ODGS annually prepares and publishes a report on Ohio's coal and industrial mineral industry. Included in the 2005 Report on Ohio Mineral Industries are certain detailed production, employment, and geologic information about each industrial mineral operation in the State. The 2005 report and the five previous years' reports may be accessed over the Internet at URL http://www.dnr.state.oh.us/Home/ogcim/minstat/minstat1/tabid/7798/Default.aspx. A Web-based Geographic Information System (GIS) version of the Ohio mineral industries map from the report allows a user to directly access a summary of industrial minerals information by permitted operation (Ohio Division of Geological Survey, 2006b§).

Among many publications produced in 2005, the ODGS released an updated version of Educational Leaflet 12, "Clay and Shale in Ohio." The leaflet describes the geologic origin, properties, uses, history, and production trends of clay and shale in Ohio. The leaflet can be accessed on the ODGS Web site (Wolfe and Blankenberker, 2005§), and free printed versions can be obtained from the Ohio DGS Geologic Records Center at 614-265-6576, or by writing to the Ohio Department of Natural Resources, Division of Geological Survey, 2045 Morse Road, Bldg. C-1, Columbus, OH 43229-6693.

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TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN OHIO[1, 2]

(Thousand metric tons and thousand dollars)

Mineral	2003		2004		2005	
	Quantity	Value	Quantity	Value	Quantity	Value
Cement:						
Masonry	W	W	98	13,000 e	W	W
Portland	1,030	82,200	1,020	85,700 e	986	89,200 e
Clays:						
Common	1,440	7,430	1,360	7,480	1,310	6,880
Fire	W	W	42	W	55	W
Gemstones	NA	4	NA	4	NA	4
Lime	1,880	114,000	1,880	127,000	1,790	130,000
Sand and gravel:						
Construction	47,300	242,000	50,800	263,000	51,700	288,000
Industrial	1,120	32,100	1,180	34,200	1,230	37,900
Stone:						
Crushed	70,500	339,000	76,500 r	396,000 r	75,200	437,000
Dimension	30	5,090	38	5,100	28	4,880
Combined values of peat, salt, and values indicated by symbol W	XX	188,000	XX	197,000	XX	211,000
Total	XX	1,010,000	XX	1,130,000 r	XX	1,210,000

eEstimated. rRevised. NA Not available. W Withheld to avoid disclosing company proprietary data. Withheld values included in "Combined values" data. XX Not applicable.

[1]Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2]Data are rounded to no more than three significant digits; may not add to totals shown.

TABLE 2
OHIO: CRUSHED STONE SOLD OR USED, BY KIND[1]

Kind	2004			2005		
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Number of quarries	Quantity (thousand metric tons)	Value (thousands)
Limestone[2]	92 r	69,500 r	$366,000 r	94	65,800	$392,000
Dolomite	8	6,570	28,000	9	8,940	42,700
Sandstone	4	457 r	2,450 r	4	467	2,700
Total	XX	76,500 r	396,000 r	XX	75,200	437,000

rRevised. XX Not applicable.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes "limestone-dolomite" reported with no distinction between the two.

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TABLE 3
OHIO: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2005, BY USE[1]

(Thousand metric tons and thousand dollars)

Use	Quantity	Value
Construction:		
Coarse aggregate (+1½ inch):		
Riprap and jetty stone	345	2,340
Filter stone	196	809
Other coarse aggregates	242	1,680
Total	783	4,820
Coarse aggregate, graded:		
Concrete aggregate, coarse	1,240	5,890
Bituminous aggregate, coarse	2,790	15,700
Bituminous surface-treatment aggregate	360	1,610
Railroad ballast	271	1,150
Other graded coarse aggregates	2,520	11,700
Total	7,180	36,000
Fine aggregate (-⅜ inch):		
Stone sand, concrete	92	512
Stone sand, bituminous mix or seal	204	1,330
Screening, undesignated	W	W
Other fine aggregates	1,050	4,460
Total	1,350	6,300
Coarse and fine aggregates:		
Graded road base or subbase	12,500	78,700
Unpaved road surfacing	7,670	46,800
Crusher run or fill or waste	259	1,070
Other coarse and fine aggregates	1,920	11,100
Total	22,400	138,000
Other construction materials	301	1,610
Agricultural:		
Limestone	501	3,090
Other agricultural uses	124	722
Total	625	3,810
Chemical and metallurgical:		
Cement manufacture	(2)	(2)
Lime manufacture	(2)	(2)
Flux stone	(2)	(2)
Glass manufacture	(2)	(2)
Total	5,610	28,700
Special:		
Asphalt fillers or extenders	(2)	(2)
Whiting or whiting substitute	(2)	(2)
Other fillers or extenders	(2)	(2)
Total	482	3,050
Other miscellaneous uses and specified uses not listed	215	950
Unspecified:[3]		
Reported	30,900	184,000
Estimated	5,300	30,000
Total	36,300	214,000
Grand total	75,200	437,000

W Withheld to avoid disclosing company proprietary data; included with "Other fine aggregates."
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Withheld to avoid disclosing company proprietary data; included in "Total."
[3]Reported and estimated production without a breakdown by end use.

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TABLE 4

OHIO: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2005, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3		District 4	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Construction:								
Coarse aggregate (+1½ inch)[2]	376	1,710	141	1,180	140	1,100	W	W
Coarse aggregate, graded[3]	4,520	19,500	W	W	W	W	W	W
Fine aggregate (-⅜ inch)[4]	700	2,210	W	W	W	W	18	118
Coarse and fine aggregate[5]	6,570	35,100	8,240	51,900	2,610	15,900	W	W
Other construction materials	132	793	--	--	146	703	--	--
Agricultural[6]	W	W	W	W	75	496	W	W
Chemical and metallurgical[7]	W	W	W	W	W	W	W	W
Special[8]	W	W	W	W	W	W	--	--
Other miscellaneous uses	180	792	--	--	35	153	--	--
Unspecified:[9]								
Reported	8,520	49,700	5,790	33,500	3,460	22,700	8,260	48,600
Estimated	2,000	12,000	326	1,900	846	4,800	--	--
Total	26,700	138,000	16,700	103,000	9,260	57,000	13,700	85,100

Use	District 5		District 6	
	Quantity	Value	Quantity	Value
Construction:				
Coarse aggregate (+1½ inch)[2]	W	W	W	W
Coarse aggregate, graded[3]	--	--	W	W
Fine aggregate (-⅜ inch)[4]	--	--	W	W
Coarse and fine aggregate[5]	W	W	W	W
Other construction materials	--	--	23	113
Agricultural[6]	W	W	151	1,090
Chemical and metallurgical[7]	--	--	--	--
Special[8]	--	--	--	--
Other miscellaneous uses	1	5	--	--
Unspecified:[9]				
Reported	2,030	12,200	2,890	17,300
Estimated	743	4,300	1,400	7,900
Total	3,210	19,900	5,630	35,100

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes filter stone, riprap and jetty stone, and other coarse aggregates.

[3]Includes bituminous aggregate (coarse), bituminous surface-treatment aggregate, concrete aggregate (coarse), railroad ballast, and other graded coarse aggregates.

[4]Includes screening (undesignated), stone sand bituminous mix or seal, stone sand (concrete), and other fine aggregates.

[5]Includes crusher run or fill or waste, graded road base or subbase, unpaved road surfacing, and other coarse and fine aggregates.

[6]Includes agricultural limestone and other agricultural uses.

[7]Includes cement manufacture, flux stone, lime manufacture, and glass manufacture.

[8]Includes asphalt fillers or extenders, whiting or whiting substitute, and other fillers and extenders.

[9]Reported and estimated production without a breakdown by end use.

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TABLE 5
OHIO: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2005,
BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	7,230	$37,900	$5.24
Plaster and gunite sands	72	896	12.44
Concrete products (blocks, bricks, pipe, decorative, etc.)	115	707	6.15
Asphaltic concrete aggregates and other bituminous mixtures	3,400	17,600	5.16
Road base and coverings	2,540	15,000	5.92
Road stabilization (cement)	80	510	6.38
Fill	5,160	25,700	4.99
Snow and ice control	103	522	5.07
Roofing granules	27	307	11.37
Filtration	64	446	6.97
Other miscellaneous uses	578	4,610	7.97
Unspecified:[2]			
Reported	21,000	123,000	5.83
Estimated	11,300	61,400	5.44
Total or average	51,700	288,000	5.58

[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.
[2]Reported and estimated production without a breakdown by end use.

TABLE 6
OHIO: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2005,
BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregates (including concrete sand)	400	2,330	2,110	11,100	2,710	14,400
Concrete products (blocks, bricks, pipe, decorative, etc.)[2]	W	W	W	W	55	344
Asphaltic concrete aggregates and other bituminous mixtures	427	1,920	860	5,120	1,100	5,640
Road base and coverings[3]	219	1,040	833	4,800	671	4,590
Fill	194	684	1,210	7,540	3,100	14,100
Snow and ice control	--	--	14	86	W	W
Other miscellaneous uses[4]	115	833	160	1,440	195	1,990
Unspecified:[5]						
Reported	--	--	3,850	23,100	7,390	44,600
Estimated	60	300	3,500	18,900	2,600	14,200
Total	1,420	7,150	12,500	72,200	17,800	99,900

Use	District 4		District 5		District 6	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregates (including concrete sand)	402	2,360	677	3,080	927	4,540
Concrete products (blocks, bricks, pipe, decorative, etc.)[2]	W	W	--	--	W	W
Asphaltic concrete aggregates and other bituminous mixtures	W	W	837	3,840	59	312
Road base and coverings[3]	W	W	566	3,080	45	286
Fill	194	1,360	317	1,460	142	579
Snow and ice control	W	W	34	140	15	84
Other miscellaneous uses[4]	552	3,750	194	1,010	21	161
Unspecified:[5]						
Reported	1,030	5,780	3,770	20,800	4,980	28,300
Estimated	3,200	17,100	1,900	10,100	100	700
Total	5,340	30,300	8,270	43,500	6,330	35,000

W Withheld to avoid disclosing company proprietary data; included in "Other miscellaneous uses." -- Zero.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes plaster and gunite sands.
[3]Includes road and other stabilization (cement).
[4]Includes filtration and roofing granules.
[5]Reported and estimated production without a breakdown by end use.

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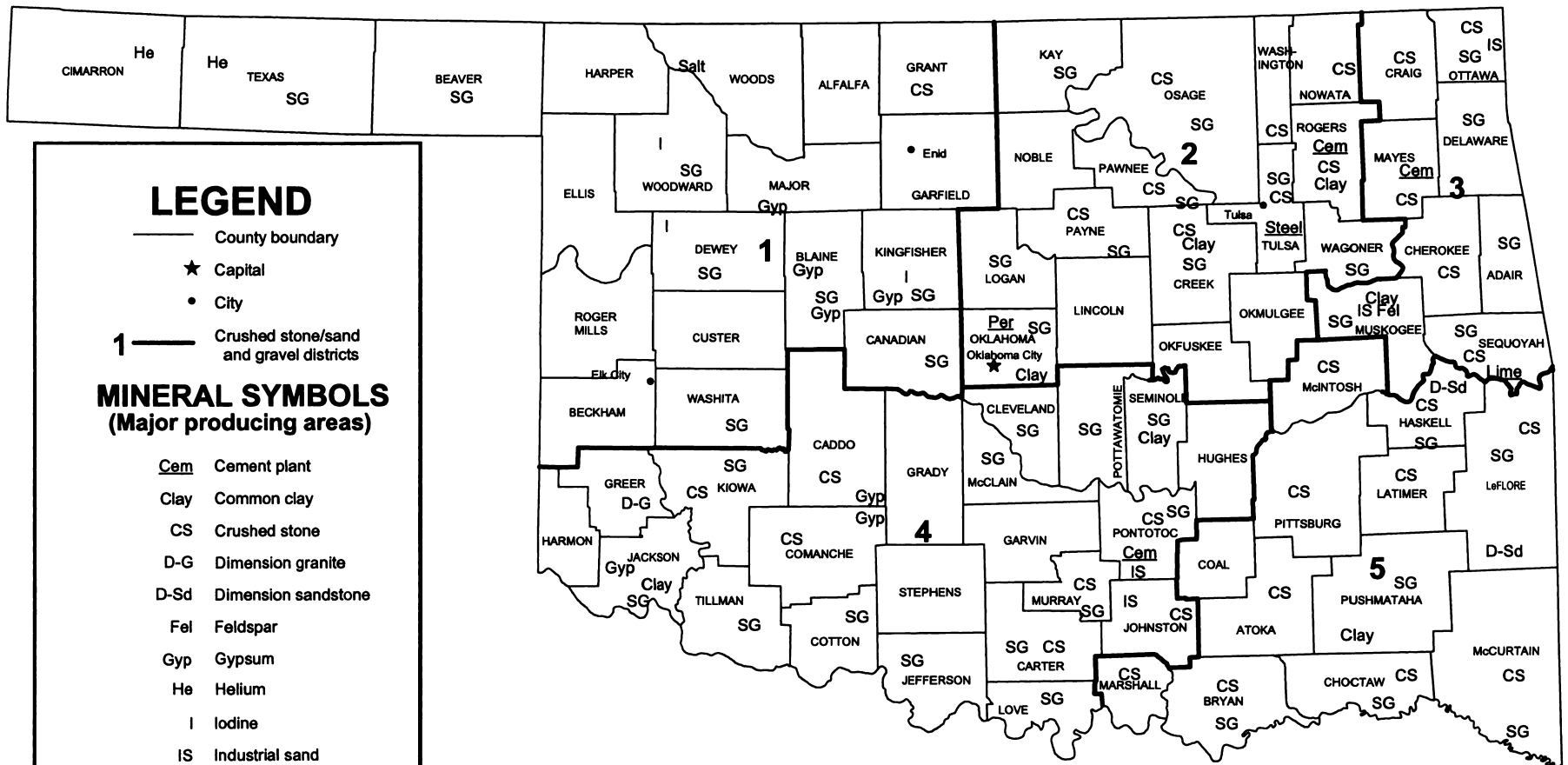
OKLAHOMA



LEGEND

- County boundary
- ★ Capital
- • City
- 1 —— Crushed stone/sand and gravel districts

MINERAL SYMBOLS
(Major producing areas)

Cem	Cement plant
Clay	Common clay
CS	Crushed stone
D-G	Dimension granite
D-Sd	Dimension sandstone
Fel	Feldspar
Gyp	Gypsum
He	Helium
I	Iodine
IS	Industrial sand
Lime	Lime plant
Per	Perlite plant
Salt	Salt
SG	Construction sand and gravel
Steel	Steel plant

0 50 Kilometers

Source: Oklahoma Geological Survey/U.S. Geological Survey (2005)

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THE MINERAL INDUSTRY OF OKLAHOMA

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Oklahoma Geological Survey for collecting information on all nonfuel minerals.

In 2005, Oklahoma's nonfuel raw mineral production was valued[1] at $606 million, based upon annual U.S. Geological Survey (USGS) data. This was an $87 million, or 16.8% increase from the State's total nonfuel mineral value of 2004, which then had increased by $49 million, or up 10.4% from 2003 to 2004. The State continued to be 31st in rank among the 50 States in total nonfuel mineral production value, of which Oklahoma accounted for more than 1% of the U.S. total value.

In 2005, crushed stone continued to be Oklahoma's leading nonfuel mineral commodity, based upon value, accounting for more than two-fifths of the State's total nonfuel mineral production value. Crushed stone was followed by cement (portland and masonry), construction sand and gravel, industrial sand and gravel, iodine, and gypsum (descending order of value). The combined values of three of Oklahoma's four major construction materials—crushed stone, construction sand and gravel, and gypsum (descending order of value)—accounted for 56% of the State's total value. (Data for cement were withheld—company proprietary data.)

Most of Oklahoma's increase in value in 2005 resulted from increases in the values of crushed stone, cement (masonry and portland), construction sand and gravel, and iodine, which rose nearly $51 million, $16 million, $11.3 million, and nearly $8 million, respectively. The unit values of each of these nonfuel mineral commodities also increased significantly. With a 14% increase in production, the value of crushed stone rose nearly 25%; an 11% increase in the production of construction sand and gravel resulted in a 21% increase in the commodity's value, and a 39% increase in iodine production led to a nearly 50% increase in its total value for the year. Likewise, although cement production decreased slightly, the commodity's value increased significantly. Smaller yet significant increases also took place in the production and values of Grade-A helium, industrial sand and gravel, and salt. Although small in comparison, the value of gemstones rebounded somewhat in 2005. The commodity's value rose to $43,000 from an uncharacteristic low of $4,000 in 2004 (table 1). In recent years, the total value of gemstones production typically has ranged from $200,000 to more than $300,000, annually; a high of more than $600,000 was reached in 1996.

Relatively few mineral commodities had decreases in value, the largest of which was in that of crude gypsum, down $2.4 million, and that of dimension stone, the production of which was down more than 80%.

Oklahoma's mines exclusively produced industrial minerals; no metals were mined in the State. In 2005, Oklahoma continued to be the only State that produced iodine and was first in the quantities of crude gypsum produced. The State also remained second of 4 States that produce tripoli and fourth in the production of feldspar. Oklahoma rose to 7th from 8th in industrial sand and gravel production, and it decreased to 11th from 8th in the production of common clays. Additionally, the State continued to be a significant producer of crushed stone, portland cement, construction sand and gravel, and masonry cement (descending order of value).

The narrative information that follows was provided by the Oklahoma Geological Survey[2] (OGS). Production data in the text that follows are those reported by the OGS based upon that agency's own surveys and estimates. Data may differ from some production figures or other data as reported to the USGS.

Mining Employment

The Oklahoma Department of Mines (ODOM) recorded that more than 343 mine operators produced nonfuel minerals from 405 mines in the State of Oklahoma in 2005; 530 mining permitted sites were on file. Almost all were open pit mines, the exceptions being iodine and salt, each produced from brine wells, helium that was produced from natural gas wells, and one limestone operation that was produced from an underground mine. The State's nonfuel mining industry directly employed 29,287 persons in 2005, excluding employees of iodine and helium operators.

Commodity Review

Industrial Minerals

Common Clays.—Boral Bricks Inc. dismantled its long closed brick plant just west of Oklahoma City in Union City, Canadian County, in November 2004 after a 2-year exploration program at the site to identify additional onsite resources. Boral purchased the old plant in 1983 from Oklahoma Brick. The original plant was built in 1962 and was a less than state-of-the-art facility even at that time. In 1990, Boral shut down the plant as a result of the rising energy costs of the late 1980s, which also had a depressing effect on the building markets in the region (Brus, 2005§[3]); the plant had further deteriorated since 1990 (Goff-Parker, 2006§). Construction on the new brick manufacturing facility began in April 2005 and was completed later in the year. The cost of the facility, which was to be in excess of 15,300 square meters in area (165,000 square

[1]The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2005 USGS mineral production data published in this chapter are those available as of December 2006. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—can be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

[2]Stanley T. Krukowski, Industrial Minerals Geologist IV with the Oklahoma Geological Survey, authored the text of the State mineral industry information provided by that agency.

[3]References that include a section mark (§) are found in the Internet References Cited section.

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feet), was estimated to be $34 million. Although output was to be mainly comprised of king size brick, Boral anticipated that it would be able to produce 100 million "standard brick equivalents" annually, thus increasing the company's brick manufacturing capacity by 6% in the United States. The plan for the plant was to supply bricks to customers in Arkansas, Oklahoma, and Texas, thus eliminating shipping costs from other Boral brick plants, which are located in the eastern United States. At full operation, the new Union City plant would have an estimated $2.5 million annual payroll, employing about 50 people to produce bricks in two production shifts, including truck drivers for raw materials and brick transport. Contract carriers (about 50-70 trucks per day) were to deliver bricks to customers in adjacent States. The plant produced its first brick on January 25, 2006 (Boral News, 2006§). Upon completion of a collection and 3-kilometer (2-mile) pipeline system, Boral expected to be able to meet about one-third of its natural gas fuel needs by firing the plant kilns in part with methane generated at the nearby landfill in Canadian County. The company also anticipated being able to use landfill gas as its entire fuel source in approximately 12 years from startup (Oklahoma Department of Environmental Quality, 2007§).

Crushed Stone.—Meridian Aggregates Co. (a wholly owned subsidiary of Martin-Marietta Materials, Inc.) continued developing an open pit mine, the North Troy project near Mill Creek, Johnston County, for aggregate production at the 280-hectare (ha) (700-acre) site. Local environmentalists opposed the company's efforts to dig a new water well on the property that would draw about 570 ha-meters (1,400 acre-feet) of water (about 1.7 million cubic meters or nearly 460 million U.S. gallons) annually. Water from the well would be used to wash the aggregates material extracted from the pit. The company set up a plan with the U.S. Department of the Interior's National Park Service and U.S. Fish and Wildlife Service to monitor the well and surrounding springs to determine if the aquifer would suffer any harmful effects. Approval for the water permit is in the jurisdiction of the Oklahoma Water Resources Board.

Dimension Stone.—Demand for dimension stone products in Oklahoma and in surrounding States continued to influence stone production, particularly in Haskell County and Leflore County. Growth in residential housing markets was responsible for a large portion of this development. Products most in demand included: building stone, field stone, decorative stone, natural stone landscaping products, and flagstone. Limestone, granite, sandstone (descending order of production) have been the principal resources mined in Oklahoma for these stone products. Dimension stone-specific legislation (specific definition) was passed by the State legislature in 2005.

Lime.—Oglebay Norton Co. announced on December 28 that its wholly owned subsidiary [Oglebay Norton Minerals (Lime) Co.] had completed the sale of Oglebay Norton Minerals (St. Clair) Co. to United States Lime and Minerals, Inc. for $14 million. The lime plant is near Marble City, Sequoyah County. Proceeds from the sale were to be reinvested in other Oglebay Norton Co. operations as well as to be used to pay down debt.

Legislation and Government Programs

The Oklahoma Legislature created a clarifying definition of "dimension stone quarry" in 2005, in part needed as a result of the increased interest in and demand for dimension stone in the State. Oklahoma Code of Law (OCL), Title 45, section 723, subsection 20, established the meaning as "a site where natural stone used as building material is excavated and the stones are selected, trimmed, or cut to specified shapes or sizes." Thereafter, the ODOM began classifying dimension stone as a new production category.

In other statutory changes, blasting permit holders were grandfathered into the appropriate standing mining legislation with regard to blasting within the limits of a municipality of 300,000 or more residences (OCL, Title 45, section 724, subparagraph N, subsection 2). In another statutory change, provision was made to allow the ODOM to levee civil fines against an operator found in violation of the provisions of the Mining Lands Reclamation Act or the rules of the Department (Title 45, section 729). Administrative changes include Oklahoma Administrative Code (OAC) 460:10-17-12 concerning the term of a mining permit, and OAC 460:10-19-5 that is concerned with permit renewals.

The OGS continued to be an active participant in the USGS-sponsored STATEMAP program; Oklahoma progress and related information may be accessed over the Internet at URL http://www.ogs.ou.edu/geolmapping/statemap/index.htm. STATEMAP is a component of the congressionally mandated National Cooperative Geologic Mapping Program (NCGMP), through which the USGS distributes Federal funds to support geologic mapping efforts through a competitive funding process. The NCGMP has three primary components: FEDMAP, which funds Federal geologic mapping projects, STATEMAP, which is a matching-funds grant program with State geological surveys, and EDMAP, a matching-funds grant program with universities that has a goal to train the next generation of geologic mappers. The State's maps that were previously published as open-file reports are now available through OGS Publication Sales as Oklahoma Geologic Quadrangle (OGQ) maps and may be accessed on the Internet at URL http://www.ogs.ou.edu/pubs.php. The following 7.5-minute quadrangles, which represent the Oklahoma City metropolitan area, were completed in 2005: Sageeyah (OGQ-56), Claremore (OGQ-57), Sperry (OGQ-61), and Collinsville (OGQ-62). Anadarko (OGQ-58), Altus (OGQ-59), and part of the Vernon (OGQ-60) 30- x 60-minute quadrangles also were completed in 2005. The focus of the geologic mapping project includes engineering, environmental, and natural resource issues.

The Oklahoma Aggregates Association (OKAA) conducted its inaugural Aggregates Day at the State Capitol, Oklahoma City, on February 10, 2005. More than 300 State legislators, their staff, and other State officials participated. Eight OKAA member companies and several State resource agencies used educational and informational exhibits to emphasize the importance of aggregates to the economy of Oklahoma, as well as to the high quality of life shared by its citizens.

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In 2005, the Oklahoma Miner Training Institute (OMTI) held 239 classes for a total of nearly 33.800 classroom hours of instruction in which 84 coal miners and 4,590 metal/nonmetal miners were trained. The OMTI operates under the direction of the Oklahoma Mining Commission. The OMTI resides at Eastern Oklahoma State College in Wilburton and provides health classes and mine safety. Classes are held on a regular schedule at the college or at mine sites throughout the State for the convenience of miners and operators. All training provided by the OMTI is free of charge to mining companies who hold mining permits in Oklahoma.

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TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN OKLAHOMA[1, 2]

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral		2003 Quantity	2003 Value	2004 Quantity	2004 Value	2005 Quantity	2005 Value
Clays, common		1,160	2,390	1,150	2,410	903	2,520
Gemstones		NA	197	NA	4	NA	43
Gypsum, crude		2,250	14,100	3,250	20,800	2,620	18,400
Iodine, crude	metric tons	1,090	15,900	1,130	15,900	1,570	23,700
Sand and gravel:							
Construction		11,000	48,500	12,000	53,700	13,300	65,000
Industrial		1,360	29,700	1,390	31,600	1,480	33,500
Stone:							
Crushed		40,100	193,000	39,800 r	206,000 r	45,400	257,000
Dimension		17	2,100	17	2,100	3	501
Tripoli	metric tons	10,600	1,960	32,100	2,120	30,600	1,950
Combined values of cement, feldspar, helium (Grade-A), lime, salt		XX	163,000	XX	183,000	XX	203,000
Total		XX	470,000	XX	519,000 r	XX	606,000

rRevised. NA Not available. XX Not applicable.
[1]Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2]Data are rounded to no more than three significant digits; may not add to totals shown.

TABLE 2
OKLAHOMA: CRUSHED STONE SOLD OR USED, BY KIND[1]

Kind	2004 Number of quarries	2004 Quantity (thousand metric tons)	2004 Value (thousands)	2005 Number of quarries	2005 Quantity (thousand metric tons)	2005 Value (thousands)
Limestone[2]	43	33,100 r	$166,000 r	43	38,500	$214,000
Granite	4	3,670	23,200	4	3,740	23,900
Sandstone and quartzite	6	2,620	15,100 r	5	2,530	16,600
Miscellaneous stone	2	424	2,090	3	583	3,110
Total	XX	39,800 r	206,000 r	XX	45,400	257,000

rRevised. XX Not applicable.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes limestone-dolomite reported with no distinction between the two.

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TABLE 3

OKLAHOMA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2005, BY USE[1]

(Thousand metric tons and thousand dollars)

Use	Quantity	Value
Construction:		
Coarse aggregate (+1½ inch):		
Riprap and jetty stone	397	2,920
Filter stone	81	510
Other coarse aggregates	25	115
Total	503	3,550
Coarse aggregate, graded:		
Concrete aggregate, coarse	994	6,490
Bituminous aggregate, coarse	484	3,100
Bituminous surface-treatment aggregate	W	W
Railroad ballast	W	W
Other graded coarse aggregates	11,600	68,200
Total	13,200	78,300
Fine aggregate (-⅜ inch):		
Stone sand, concrete	W	W
Stone sand, bituminous mix or seal	W	W
Screening, undesignated	1,430	5,930
Other fine aggregates	73	516
Total	2,040	8,630
Coarse and fine aggregates:		
Graded road base or subbase	1,500	7,790
Unpaved road surfacing	140	678
Crusher run or fill or waste	5,990	27,500
Other coarse and fine aggregtates	2,810	12,400
Total	10,400	48,300
Other construction materials	1	5
Agricultural:		
Agricultural limestone	70	267
Poultry grit and mineral food	(2)	(2)
Chemical and metallurgical:		
Cement manufacture	(2)	(2)
Lime manufacture	(2)	(2)
Special, other fillers or extenders	(2)	(2)
Other miscellaneous uses and specified uses not listed	33	162
Unspecified:[3]		
Regorted	11,400	72,300
Estimated	5,200	28,000
Total	16,600	100,000
Grand total	45,400	257,000

W Withheld to avoid disclosing company proprietary data; included in "Total."

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Withheld to avoid disclosing company proprietary data; included in "Grand total."

[3]Reported and estimated production without a breakdown by end use.

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TABLE 4

OKLAHOMA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2005, BY USE AND DISTRICT[1, 2]

(Thousand metric tons and thousand dollars)

Use	District 1 and 2		District 3		District 4	
	Quantity	Value	Quantity	Value	Quantity	Value
Construction:						
Coarse aggregate (+1½ inch)[3]	127	1,230	W	W	W	W
Coarse aggregate, graded[4]	1,730	12,000	--	--	W	W
Fine aggregate (-⅜ inch)[5]	W	W	W	W	W	W
Coarse and fine aggregates[6]	4,740	23,700	W	W	W	W
Other construction materials	--	--	1	5	--	--
Agricultural[7]	W	W	W	W	--	--
Chemical and metallurgical[8]	W	W	W	W	--	--
Special[9]	--	--	W	W	--	--
Other miscellaneous uses and specified uses not listed	--	--	--	--	--	--
Unspecified:[10]						
Reported	1,930	10,300	1,460	7,810	4,650	30,500
Estimated	--	--	862	4,600	1,700	9,300
Total	10,100	53,000	4,390	29,500	22,400	124,000

	District 5	
	Quantity	Value
Construction:		
Coarse aggregate (+1½ inch)[3]	W	W
Coarse aggregate, graded[4]	W	W
Fine aggregate (-⅜ inch)[5]	W	W
Coarse and fine aggregates[6]	1,120	5,380
Other construction materials	--	--
Agricultural[7]	W	W
Chemical and metallurgical[8]	--	--
Special[9]	--	--
Other miscellaneous uses and specified uses not listed	33	162
Unspecified:[10]		
Reported	3,380	23,700
Estimated	2,600	14,000
Total	8,500	51,000

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Districts 1 and 2 are combined to avoid disclosing company proprietary data.

[3]Includes filter stone, riprap and jetty stone, and other coarse aggregates.

[4]Includes bituminous aggregate (coarse), bituminous surface-treatment aggregate, concrete aggregate (coarse), railroad ballast, and other graded coarse aggregates.

[5]Includes screening (undesignated), stone sand (bituminous mix or seal), stone sand (concrete), and other fine aggregates.

[6]Includes crusher run or fill or waste, graded road base or subbase, unpaved road surfacing, and other coarse and fine aggregates.

[7]Includes agricultural limestone and poultry grit and mineral food.

[8]Includes cement and lime manufacture.

[9]Includes other fillers or extenders.

[10]Reported and estimated production without a breakdown by end use.

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TABLE 5
OKLAHOMA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2005,
BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	4,440	$25,800	$5.81
Plaster and gunite sands	113	734	6.50
Concrete products (blocks, bricks, pipe, decorative, etc.)	97	422	4.35
Asphaltic concrete aggregates and other bituminous mixtures	297	994	3.35
Road base and coverings	456	1,330	2.92
Fill[2]	1,770	6,210	3.51
Unspecified:[3]			
Reported	2,430	11,900	4.89
Estimated	3,730	17,700	4.75
Total or average	13,300	65,000	4.88

[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes snow and ice control.
[3]Reported and estimated production without a breakdown by end use.

TABLE 6
OKLAHOMA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2005,
BY USE AND DISTRICT[1, 2]

(Thousand metric tons and thousand dollars)

	District 1 and 4		Districts 2, 3, and 5	
Use	Quantity	Value	Quantity	Value
Concrete aggregates and concrete products[3]	1,790	10,900	2,860	16,000
Asphaltic concrete aggregates and road base materials	500	1,410	254	912
Fill[4]	995	2,280	774	3,930
Unspecified:[5]				
Reported	2,200	10,700	230	1,140
Estimated	1,870	8,870	1,860	8,830
Total	7,350	34,200	5,980	30,800

[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Districts 1 and 4, and 2, 3, and 5 are combined to avoid disclosing company proprietary data.
[3]Includes plaster and gunite sands.
[4]Includes snow and ice control.
[5]Reported and estimated production without a breakdown by end use.

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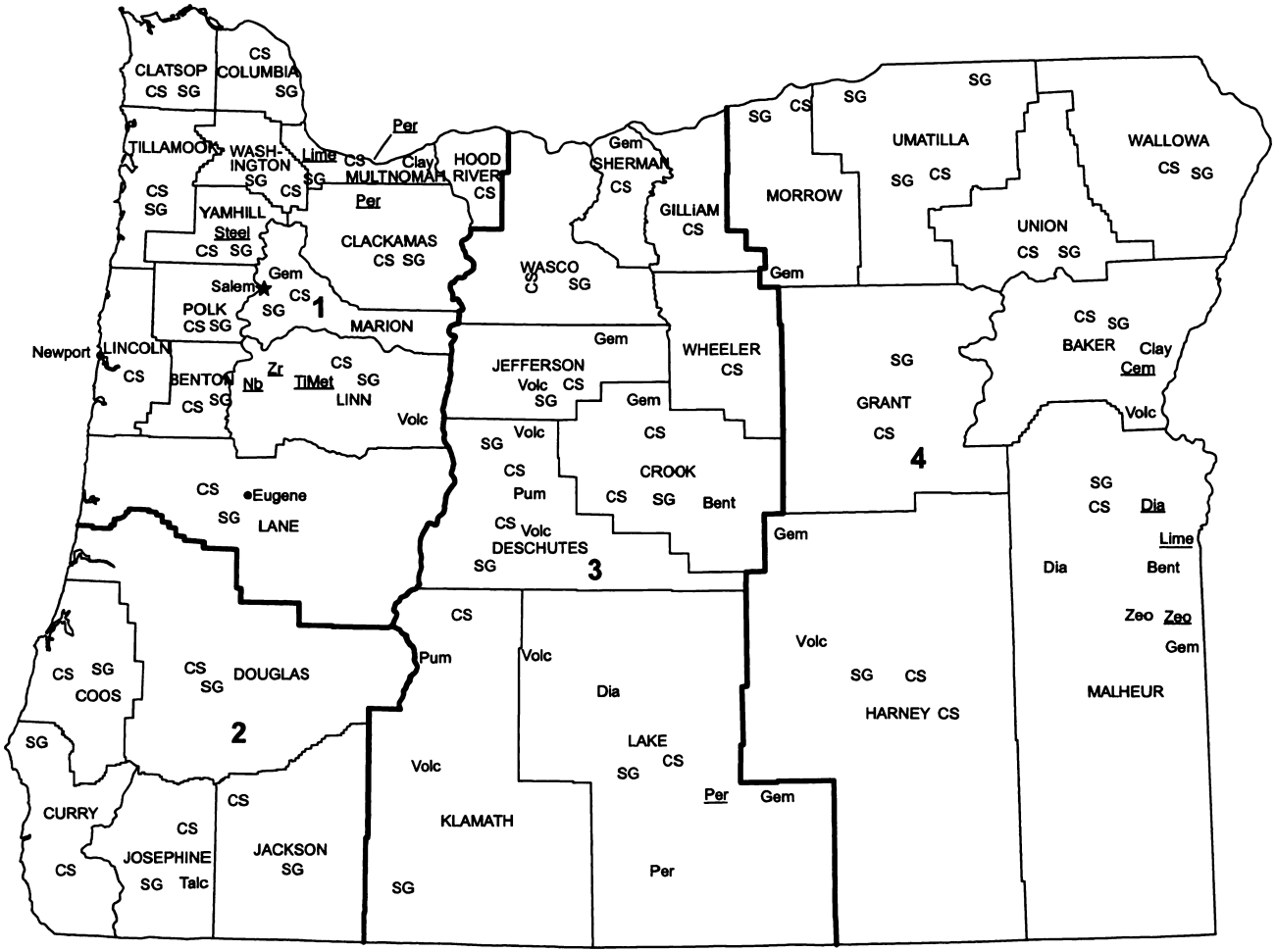
OREGON



LEGEND

- County boundary
- ★ Capital
- • City
- 1 Crushed stone/sand and gravel districts

MINERAL SYMBOLS
(Major producing areas)

Bent	Bentonite
Cem	Cement plant
Clay	Common clay
CS	Crushed stone
Dia	Diatomite
Dia	Diatomite plant
Gem	Gemstone
Lime	Lime plant
Nb	Columbium (niobium) plant
Per	Perlite
Per	Perlite plant
Pum	Pumice and pumicite
SG	Construction sand and gravel
Steel	Steel plant
Talc	Talc minerals
TiMet	Titanium metal plant
Volc	Volcanic cinder
Zeo	Zeolites
Zeo	Zeolite plant
Zr	Zirconium plant

0 50 Kilometers

Source: Oregon Department of Geology and Mineral Industries/U.S. Geological Survey (2005)

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THE MINERAL INDUSTRY OF OREGON

In 2005, Oregon's nonfuel raw mineral production was valued[1] at $432 million, based upon annual U.S. Geological Survey (USGS) data. This was an increase of $65 million, up 17.7% from the State's total nonfuel mineral value of $367 million in 2004, which followed a $47 million or 14.7% increase from 2003 to 2004. The State remained 35th in rank among the 50 States in total nonfuel mineral production value and accounted for nearly 1% of the U.S. total value.

Industrial minerals accounted for all of Oregon's nonfuel raw mineral and material production, most of which showed increases in value in 2005. Construction sand and gravel and crushed stone, by value, remained the State's two leading nonfuel mineral commodities, followed by portland cement, diatomite, and lime (descending order of value). The former two accounted for more than 70% of Oregon's total nonfuel mineral value, while the combined total of these five accounted for more than 97% of the State's total nonfuel raw mineral economy. Increases in the values of construction sand and gravel, crushed stone, and portland cement led the State's rise in value from that of 2004. With a 14.5% increase in crushed stone production, the commodity's total value rose by $31 million, up nearly 25%. Increases in construction sand and gravel also were significant; a 5% increase in production led to a $21 million, or 17% increase in its total value. Not far behind were increases in the production and total value of portland cement (data withheld—company proprietary data). A smaller yet significant increase also took place in the production and value of diatomite. The only decreases in value were small relative to the increases that took place in pumice and pumicite, lime, and gemstones (descending order of change).

In 2005, Oregon continued to be second in the quantity of crude perlite produced as compared with other producing States, and third in diatomite and gemstones (gemstones based upon value). The State decreased in rank to a near-first, second in rank in the production of pumice and pumicite and remained a significant producer of crushed stone and construction sand and gravel (descending order of order of change).

In 2005, Oregon continued to be second in the quantity of crude perlite produced as compared with other producing States, and third in diatomite and gemstones (gemstones based upon value). The State decreased in rank to a near-first, second in rank in the production of pumice and pumicite and remained a significant producer of crushed stone and construction sand and gravel (descending order of value).

[1]The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2005 USGS mineral production data published in this chapter are those available as of December 2006. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—can be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN OREGON[1, 2]

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral	2003		2004		2005	
	Quantity	Value	Quantity	Value	Quantity	Value
Clays, bentonite	W	W	10	W	9	W
Gemstones	NA	1,200	NA	1,210	NA	1,180
Sand and gravel, construction	18,500	110,000	21,000	125,000	22,000	146,000
Stone, crushed	21,800	117,000	22,700 r	126,000	26,000	157,000
Zeolites metric tons	W	NA	--	--	--	--
Combine value of cement (portland), clays (common), diatomite, lime, perlite (crude), pumice and pumicite, talc (crude), and values indicated by symbol W	XX	92,700	XX	114,000	XX	128,000
Total	XX	320,000	XX	367,000	XX	432,000

rRevised. NA Not available. W Withheld to avoid disclosing company proprietary data. Withheld values included in "Combined values" data.
XX Not applicable. -- Zero.

[1]Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2]Data are rounded to no more than three significant digits; may not add to totals shown.

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TABLE 2
OREGON: CRUSHED STONE SOLD OR USED, BY KIND[1]

Kind	2004 Number of quarries	2004 Quantity (thousand metric tons)	2004 Value (thousands)	2005 Number of quarries	2005 Quantity (thousand metric tons)	2005 Value (thousands)
Limestone	2	W	W	1	W	W
Granite	1	W	W	1	W	W
Traprock	144 r	19,000 r	$106,000 r	118	22,500	136,000
Volcanic cinder and scoria	5 r	68	353	3	47	261
Miscellaneous stone	11	2,420	11,900	13	2,180	12,700
Total	XX	22,700 r	126,000	XX	26,000	157,000

rRevised. W Withheld to avoid disclosing company proprietary data; included in "Total." XX Not applicable.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.

TABLE 3
OREGON: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2005, BY USE[1]

(Thousand metric tons and thousand dollars)

Use	Quantity	Value
Construction:		
Coarse aggregate (+1½ inch):		
Macadam	W	W
Riprap and jetty stone	41	373
Filter stone	60	473
Other coarse aggregates	459	2,450
Total	560	3,300
Coarse aggregate, graded:		
Concrete aggregate, coarse	47	373
Bituminous aggregate, coarse	405	2,430
Bituminous surface-treatment aggregate	9	76
Railroad ballast	195	1,380
Other graded coarse aggregates	20	203
Total	676	4,470
Fine aggregate (-⅜ inch):		
Stone sand, concrete	(2)	(2)
Stone sand, bituminous mix or seal	(2)	(2)
Screening, undesignated	(2)	(2)
Other fine aggregates	38	383
Total	114	959
Coarse and fine aggregates:		
Graded road base or subbase	3,810	25,200
Unpaved road surfacing	810	4,220
Terrazzo and exposed aggregate	(2)	(2)
Crusher run or fill or waste	723	4,175
Roofing granules	(2)	(2)
Other coarse and fine aggregates	1,240	7,420
Total	6,610	41,200
Other construction materials	6	10
Chemical and metallurgical, cement manufacture	(3)	(3)
Other miscellaneous uses, sugar refining	(3)	(3)
Unspecified:[4]		
Reported	8,500	50,500
Estimated	8,300	49,000
Total	16,800	99,400
Grand total	26,000	157,000

W Withheld to avoid disclosing company proprietary data; included with "Other coarse aggregates."
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Withheld to avoid disclosing company proprietary; included in "Total."
[3]Withheld to avoid disclosing company proprietary; included in "Grand total."
[4]Reported and estimated production without a breakdown by end use.

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TABLE 4

OREGON: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2005, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Construction:						
Coarse aggregate (+1½ inch)[2]	W	W	W	W	W	W
Coarse aggregate, graded[3]	W	W	W	W	W	W
Fine aggregate (-⅜ inch)[4]	W	W	--	--	W	W
Coarse and fine aggregates[5]	4,230	28,200	W	W	W	W
Other construction materials	--	--	6	10	--	--
Chemical and metallurgical[6]	--	--	--	--	--	--
Other miscellaneous uses[7]	--	--	--	--	--	--
Unspecified:[8]						
Reported	4,530	27,200	1,150	6,910	1,170	6,960
Estimated	4,600	27,000	1,600	9,700	1,900	12,000
Total	14,100	86,700	3,980	24,300	3,560	21,700

	District 4		Unspecified districts	
	Quantity	Value	Quantity	Value
Construction:				
Coarse aggregate (+1½ inch)[2]	W	W	--	--
Coarse aggregate, graded[3]	W	W	--	--
Fine aggregate (-⅜ inch)[4]	W	W	--	--
Coarse and fine aggregates[5]	W	W	611	2,470
Other construction materials	--	--	--	--
Chemical and metallurgical[6]	W	W	--	--
Other miscellaneous uses[7]	W	W	--	--
Unspecified:[8]				
Reported	4	19	1,660	9,380
Estimated	129	599	--	--
Total	2,140	12,000	2,270	11,800

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes filter stone, macadam, riprap and jetty stone, and other coarse aggregates.

[3]Includes bituminous aggregate (coarse), bituminous surface-treatment aggregate, concrete aggregate (coarse), railroad ballast, and other graded coarse aggregates.

[4]Includes screening (undesignated), stone sand (bituminous mix or seal), stone sand (concrete), and other fine aggregates.

[5]Includes crusher run or fill or waste, graded road base or subbase, roofing granules, terrazzo and exposed aggregate, unpaved road surfacing, and other coarse and fine aggregates.

[6]Includes cement manufacture.

[7]Includes sugar refining.

[8]Reported and estimated production without a breakdown by end use.

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TABLE 5
OREGON: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2005,
BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	4,420	$32,400	$7.33
Plaster and gunite sands	16	231	14.44
Concrete products (blocks, bricks, pipe, decorative, etc.)[2]	25	216	8.64
Asphaltic concrete aggregates and other bituminous mixtures	2,010	15,400	7.67
Road base and coverings	4,350	27,200	6.24
Fill	392	1,580	4.02
Snow and ice control	17	154	9.06
Other miscellaneous uses[3]	622	3,710	5.97
Unspecified:[4]			
Reported	6,900	44,400	6.43
Estimated	3,240	20,600	6.34
Total or average	22,000	146,000	6.63

[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.
[2]Includes plaster and gunite sands.
[3]Includes snow and ice control.
[4]Reported and estimated production without a breakdown by end use.

TABLE 6
OREGON: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2005,
BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		Districts 2 & 3		District 4	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregates (including concrete sand)[2]	2,670	17,200	1,650	14,100	118	1,280
Concrete products (blocks, bricks, pipe, decorative, etc.)	25	216	--	--	--	--
Asphaltic concrete aggregates and other bituminous mixtures	922	6,290	W	W	W	W
Road base and coverings	3,240	21,400	873	4,370	204	1,230
Fill	93	369	286	1,180	13	33
Other miscellaneous uses[3]	513	3,250	1,100	9,040	84	527
Unspecified:[4]						
Reported	6,300	41,300	89	671	342	1,850
Estimated	1,400	8,860	1,440	9,150	402	2,550
Total	15,200	98,800	5,440	38,500	1,160	7,470

Use	Unspecified districts	
	Quantity	Value
Concrete aggregates (including concrete sand)[2]	--	--
Concrete products (blocks, bricks, pipe, decorative, etc.)		
Asphaltic concrete aggregates and other bituminous mixtures	24	133
Road base and coverings	37	195
Fill	--	--
Other miscellaneous uses[3]	--	--
Unspecified:[4]	--	--
Reported	167	607
Estimated	--	--
Total	228	934

W Withheld to avoid disclosing company proprietary data; included in "Other miscellaneous uses." -- Zero.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Districts 2 and 3 are combined to avoid disclosing company proprietary data.
[2]Includes plaster and gunite sands.
[3]Includes snow and ice control.
[4]Reported and estimated production without a breakdown by end use.

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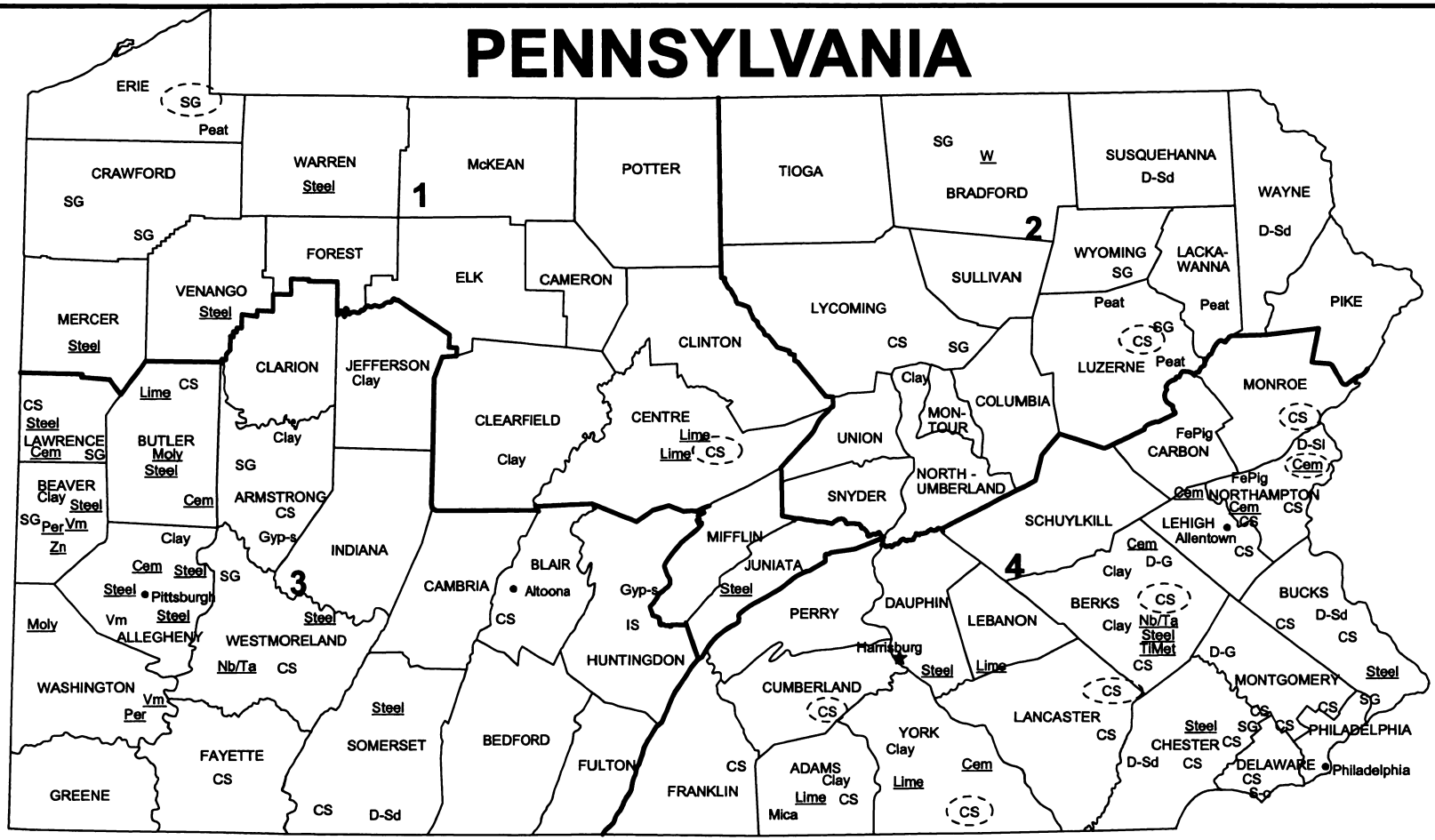
PENNSYLVANIA



LEGEND

- County boundary
- ★ Capital
- • City
- 1 —— Crushed stone/sand and gravel districts

MINERAL SYMBOLS (Major producing areas)

Cem	Cement plant	IS	Industrial sand	SG	Construction sand and gravel
Clay	Common clay	Lime	Lime plant	Steel	Steel plant
CS	Crushed stone	Mica	Mica	TlMet	Titanium metal plant
D-G	Dimension granite	Moly	Molybdenum plant	Tr	Tripoli
D-Sd	Dimension sandstone	Nb/Ta	Columbium (niobium) and tantalum plant	Vm	Vermiculite plant
D-Sl	Dimension slate	Peat	Peat	W	Tungsten plant
FePig	Iron oxide pigments	Per	Perlite plant	Zn	Zinc plant
Gyp-s	Synthetic gypsum	S-o	Sulfur (oil)	⬭	Concentration of mineral operations

0 50 Kilometers

Source: Pennsylvania Bureau of Topographic and Geologic Survey/U.S. Geological Survey (2005)

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The Mineral Industry of Pennsylvania

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Pennsylvania Bureau of Topographic and Geologic Survey for collecting information on all nonfuel minerals.

In 2005, Pennsylvania's nonfuel raw mineral production was valued[1] at $1.55 billion, based upon annual U.S. Geological Survey (USGS) data. This was a 9.9%, or an $140 million, increase from the $1.41 billion total value for 2004, which also had increased, up 11% (also up $140 million) from 2003. Pennsylvania was 12th in rank (11th in 2004) in the Nation in total nonfuel mineral production value and accounted for nearly 3% of the U.S. total value. [The actual totals for 2003 and 2005 are higher than those shown in table 1; industrial sand and gravel (2003) and tripoli (2003 and 2005) data have been withheld (company proprietary data) from the combined values in that table.]

In 2004, Pennsylvania continued to be among the Nation's leading States in the production of crushed stone, cement (portland and masonry), and construction sand and gravel (descending order of value). These mineral commodities accounted for slightly more than 91.5% of the Pennsylvania's total nonfuel raw mineral production value. Lime accounted for about 6.7% of the value (table 1), followed by industrial sand and gravel and dimension stone. In 2005, led especially by portland cement and crushed stone, most of the State's mineral commodities increased in value. Although production of portland cement was up only 1% and crushed stone production actually decreased by 6%, the commodities' total values increased significantly. The value of portland cement rose 17%, up by $81 million, and crushed stone value increased more than 10%, up $65 million, (table 1). Other mineral commodities with significant increases in value were masonry cement, lime (up $4 million), industrial sand and gravel, and dimension stone (up nearly $2 million). The only large decrease in value took place in construction sand and gravel; a nearly 13% decrease in production led to a $16 million drop in the commodity's total value (table 1).

In 2005, Pennsylvania continued to be ranked third in the Nation in the quantity of portland cement produced, fourth of four States that produced tripoli, and sixth in masonry cement, while also the State dropped in rank to third from second in the production of crushed stone and to seventh from sixth in lime. Additionally, substantial quantities of construction sand and gravel, industrial sand and gravel, dimension stone, and common clays were produced in the State.

With regard to raw minerals and mineral materials, Pennsylvania is exclusively an industrial mineral- and coal-producing State, producing no primary metals from ores mined within the State; metals that were produced in the State, principally steel, as well as, columbium, tantalum, titanium, and zinc, were processed from materials acquired from foreign and other domestic sources. Pennsylvania ranked fourth in the Nation (third in 2004) in the production of raw steel in 2005, with an output of 5.9 million metric tons (Mt), down slightly from the 6.26 Mt produced in 2004 (American Iron and Steel Institute, 2006, p. 74).

[1]The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2005 USGS mineral production data published in this chapter are those available as of December 2006. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—can be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

Reference Cited

American Iron and Steel Institute, 2006, Table 24—Raw steel production by States, in American Iron and Steel Institute, AISI 2005 ASR: Washington, DC, American Iron and Steel Institute, 140 p.

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TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN PENNSYLVANIA[1,2]

(Thousand metric tons and thousand dollars)

Mineral	2003		2004		2005	
	Quantity	Value	Quantity	Value	Quantity	Value
Cement:						
Masonry	342	35,900 e	W	W	399	49,700 e
Portland	5,720	421,000 e	6,230	473,000 e	6,290	554,000 e
Clays, common	750	2,240	822	3,270	705	3,460
Gemstones	NA	1	NA	1	NA	1
Lime	1,190	90,100	1,220	100,000	1,100	104,000
Peat	8	219	11	307	7	210
Sand and gravel:						
Construction	18,400	115,000	20,000	127,000	17,000	111,000
Industrial	W	W	W	W	711	15,400
Stone:						
Crushed	104,000	597,000	113,000 r	639,000 r	106,000	704,000
Dimension	32	10,400	33	10,100	35	11,800
Combined values of tripoli and values indicated by symbol W	XX	(3)	XX	55,800	XX	(3)
Total	XX	1,270,000	XX	1,410,000 r	XX	1,550,000

eEstimated. rRevised. NA Not available. W Withheld to avoid disclosing company proprietary data. Withheld values included in "Combined values" data. XX Not applicable.

[1]Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

[2]Data are rounded to no more than three significant digits; may not add to totals shown.

[3]Value withheld to avoid disclosing company proprietary data.

TABLE 2
PENNSYLVANIA: CRUSHED STONE SOLD OR USED, BY KIND[1]

Kind	2004			2005		
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Number of quarries	Quantity (thousand metric tons)	Value (thousands)
Limestone[2]	102	67,200 r	$378,000 r	106	62,100	$420,000
Dolomite	14	15,400 r	86,100 r	13	12,400	79,700
Marble	1	W	W	1	W	W
Granite	7	5,110 r	29,200 r	7	6,450	40,700
Traprock	8	5,710	34,000	9	4,670	31,200
Sandstone and quartzite	35	10,800 r	63,500 r	37	10,300	70,800
Slate	1	W	W	1	W	W
Miscellaneous stone	13	7,540 r	43,300 r	15	8,870	57,800
Total	XX	113,000 r	639,000 r	XX	106,000	704,000

rRevised. W Withheld to avoid disclosing company proprietary data; included in "Total." XX Not applicable.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes "limestone-dolomite" reported with no distinction between the two.

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TABLE 3

PENNSYLVANIA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2005, BY USE[1]

(Thousand metric tons and thousand dollars)

Use	Quantity	Value
Construction:		
Coarse aggregate (+1½ inch):		
Macadam	423	3,260
Riprap and jetty stone	1,020	7,550
Filter stone	527	3,830
Other coarse aggregates	2,320	18,300
Total	4,290	32,900
Coarse aggregate, graded:		
Concrete aggregate, coarse	3,260	22,900
Bituminous aggregate, coarse	5,880	40,800
Bituminous surface-treatment aggregate	2,580	19,300
Railroad ballast	821	6,180
Other graded coarse aggregates	6,600	48,200
Total	19,100	137,000
Fine aggregate (-¾ inch):		
Stone sand, concrete	827	4,580
Stone sand, bituminous mix or seal	3,500	23,600
Screening, undesignated	907	10,300
Other fine aggregates	3,520	24,200
Total	8,750	62,700
Coarse and fine aggregates:		
Graded road base or subbase	6,120	36,700
Unpaved road surfacing	1,000	6,600
Crusher run or fill or waste	1,500	6,900
Other coarse and fine aggregates	10,600	58,200
Total	19,200	108,000
Other construction materials[2]	735	5,860
Agricultural:		
A pricultural limestone	526	5,810
Other agricultural uses	5	30
Total	531	5,840
Chemical and metallurgical:		
Cement manufacture	3,270	23,500
Lime manufacture	W	W
Flux stone	W	W
Sulfur oxide removal	446	3,680
Total	3,970	28,900
Special:		
Mine dusting or acid water treatment	W	W
Whiting or whiting substitute	W	W
Other fillers or extenders	W	W
Total	367	6,020
Other miscellaneous uses and specified uses not listed	2,250	15,300
Unspecified:[3]		
Reported	28,900	183,000
Estimated	17,000	120,000
Total	46,200	301,000
Grand total	106,000	704,000

W Withheld to avoid disclosing company proprietary data; included in "Total."

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes drain fields.

[3]Reported and estimated production without a breakdown by end use.

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TABLE 4

PENNSYLVANIA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2005, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Construction:						
Coarse aggregate (+1½ inch)[2]	303	2,270	574	4,170	1,290	10,600
Coarse aggregate, graded[3]	925	6,510	1,260	8,750	4,760	36,100
Fine aggregate (-⅜ inch)[4]	W	W	W	W	W	W
Coarse and fine aggregates[5]	766	4,440	1,470	8,320	3,540	21,900
Other construction materials[6]	47	329	--	--	101	857
Agricultural[7]	W	W	W	W	W	W
Chemical and metallurgical[8]	W	W	W	W	W	W
Special[9]	--	--	W	W	W	W
Other miscellaneous uses and specified uses not listed	--	--	25	175	1,230	9,810
Unspecified:[10]						
Reported	1,390	8,360	2,390	14,900	5,060	30,100
Estimated	2,000	13,000	2,500	17,000	1,700	11,000
Total	6,310	41,600	9,280	61,100	21,500	149,000

	District 4	
	Quantity	Value
Construction:		
Coarse aggregate (+1½ inch)[2]	2,130	15,900
Coarse aggregate, graded[3]	12,200	86,100
Fine aggregate (-⅜ inch)[4]	5,250	39,600
Coarse and fine aggregates[5]	13,500	73,700
Other construction materials[6]	587	4,670
Agricultural[7]	W	W
Chemical and metallurgical[8]	W	W
Special[9]	W	W
Other miscellaneous uses and specified uses not listed	993	5,290
Unspecified:[10]		
Reported	20,000	129,000
Estimated	11,000	76,000
Total	68,400	452,000

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes filter stone, macadam, riprap and jetty stone, and other coarse aggregates.

[3]Includes bituminous aggregate (coarse), bituminous surface-treatment aggregate, concrete aggregate (coarse), railroad ballast, and other graded coarse aggregates.

[4]Includes screening (undesignated), stone sand bituminous mix or seal, stone sand (concrete), and other fine aggregates.

[5]Includes crusher run or fill or waste, graded road base or subbase, unpaved road surfacing, and other coarse and fine aggregates.

[6]Includes drain fields.

[7]Includes agricultural limestone and other agricultural uses.

[8]Includes cement manufacture, flux stone, lime manufacture, and sulfur oxide removal.

[9]Includes mine dusting or acid water treatment, whiting or whiting substitute and other fillers or extenders.

[10]Reported and estimated production without a breakdown by end use.

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TABLE 5
PENNSYLVANIA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2005,
BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	1,990	$15,900	$8.02
Plaster and gunite sands	9	107	11.89
Concrete products (blocks, bricks, pipe, decorative, etc.)	200	1,580	7.88
Asphaltic concrete aggregates and other bituminous mixtures	1,130	7,920	6.99
Road base and coverings	1,580	10,100	6.41
Fill	2,920	14,000	4.80
Snow and ice control	264	1,260	4.76
Other miscellaneous uses[2]	420	4,200	10.00
Unspecified:[3]			
Reported	2,940	20,500	6.98
Estimated	5,520	35,600	6.45
Total or average	17,000	111,000	6.55

[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.
[2]Includes filtration and railroad ballast.
[3]Reported and estimated production without a breakdown by end use.

TABLE 6
PENNSYLVANIA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2005,
BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregates and concrete products[2]	647	4,970	W	W	W	W
Asphaltic concrete aggregates and other bituminous mixtures	614	5,160	W	W	192	743
Road base and coverings	759	4,810	W	W	W	W
Fill	295	1,230	200	1,020	242	1,120
Snow and ice control	144	693	W	W	W	W
Other miscellaneous uses[3]	167	1,460	852	6,140	576	2,990
Unspecified:[4]						
Reported	500	3,370	604	4,090	1,110	7,560
Estimated	1,080	6,930	631	4,070	3,460	22,300
Total	4,200	28,600	2,490	16,600	5,580	34,700

Use	District 4	
	Quantity	Value
Concrete aggregates and concrete products[2]	790	7,280
Asphaltic concrete aggregates and other bituminous mixtures	W	W
Road base and coverings	406	2,920
Fill	2,180	10,700
Snow and ice control	W	W
Other miscellaneous uses[3]	244	2,690
Unspecified:[4]		
Reported	718	5,470
Estimated	355	2,290
Total	4,700	31,300

W Withheld to avoid disclosing company proprietary data; included in "Other miscellaneous uses."
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes plaster and gunite sands.
[3]Includes filtration and railroad ballast.
[4]Reported and estimated production without a breakdown by end use.

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PUERTO RICO

LEGEND

★ Capital • City ——— Municipality

MINERAL SYMBOLS

(Major producing areas)

Cem	Cement plant	DS	Dimension stone	Salt	Salt
Clay	Common clay	IS	Industrial sand	SG	Construction sand and gravel
CS	Crushed stone	Lime	Lime plant		

Source: Department of Natural Resources, Commonwealth of Puerto Rico/U.S. Geological Survey (2005)

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The Mineral Industry of Puerto Rico and the Administered Islands[1]

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Puerto Rico Department of Natural Resources, Bureau of Geology, for collecting information on all nonfuel minerals.

In 2005, Puerto Rico's nonfuel raw mineral production was value[2] at $209 million, based upon annual U.S. Geological Survey (USGS) data. If ranked in comparison with the 50 States, Puerto Rico would rank 41st in total nonfuel mineral production value.

Portland cement, by value, continued to be the Commonwealth's leading nonfuel mineral commodity, followed by crushed stone. In 2005, the nonfuel mineral production value of portland cement rose significantly despite no increase in production; the commodity's increase in value accounted for the largest portion of Puerto Rico's increase in nonfuel mineral production value. The largest decrease in value was $5.7 million in crushed stone, the production of which was down by 10% (table 1).

Similarly, in 2004, the largest increase in production value was in portland cement (with a slight increase in average unit value), and the largest decrease in production value was in crushed stone. With a 5% decrease in production, the value of crushed stone went down by $2.4 million.

In 2005, Puerto Rico produced significant quantities of portland cement; the Commonwealth would rank 19th if ranked in comparison with the 37 producing States. Construction sand and gravel was produced in Puerto Rico, mainly for use as aggregate in concrete and concrete products, as road base materials, and as fill, but production data are not available. The collection and compilation of production data for construction sand and gravel were discontinued by the U.S. Bureau of Mines (the Federal Government Agency then responsible for collecting domestic raw nonfuel mineral production data) because of a substantially low rate of response to surveys by the industry (Sikich and Alonso, 1993).

Of the U.S. Administered Islands, only American Samoa, the Virgin Islands, and Guam recently have reported nonfuel mineral production data, and these have been limited to crushed stone. Crushed stone production and value data for Guam and the Virgin Islands (limestone and traprock) are shown in table 1. Data for the production of crushed stone for American Samoa (traprock) and the Virgin Islands (2003-04) have been withheld (company proprietary data).

[1]While a Memorandum of Understanding (MOU) was officially made between the U.S. Geological Survey (USGS) and the Commonwealth of Puerto Rico, MOUs were not established with the Commonwealth of the Northern Mariana Islands, U.S. Caribbean and Pacific Island Possessions, or the U.S. Trust Territory of the Pacific Islands. Nevertheless, data on nonfuel raw mineral production were reported from several of the Administered Islands to the USGS. Only aggregated crushed stone data for the island of Guam of the Pacific Island Possessions are nonproprietary; these data appear in table 1.

[2]The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2005 USGS mineral production data published in this chapter are those available as of December 2006. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—can be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

Reference Cited

Sikich, S.W., and Alonso, R.M., 1993, The mineral industries of Puerto Rico, Northern Marianas, Island Possessions, and Trust Territory: U.S. Bureau of Mines Minerals Yearbook 1992, v. II, p. 467-470.

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TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN THE COMMONWEALTH OF PUERTO RICO AND ISLANDS ADMINISTERED BY THE UNITED STATES[1, 2]

(Thousand metric tons and thousand dollars)

Mineral	2003		2004		2005	
	Quantity	Value	Quantity	Value	Quantity	Value
Puerto Rico:						
Cement, portland	1,490	W	1,580	W	1,580	W
Clays, common	114	585	114	585	116	596
Lime	W	W	11	2,250	11	2,250
Salt	45	1,500	45	1,500	45	1,500
Stone, crushed	9,130	60,000	8,660	57,600	7,830	51,900
Combined values of sand and gravel (industrial), stone (dimension marble), and values indicated by symbol W	XX	119,000	XX	125,000	XX	153,000
Total	XX	181,000	XX	187,000	XX	209,000
Administered Islands:						
American Samoa, stone, crushed, traprock	W	(3)	W	(3)	W	(3)
Guam, stone, crushed	728	7,670	1,410	13,000	1,410	13,000
Virgin Islands, stone, crushed limestone and traprock	W	(3)	W	(3)	257	2,730
Total	XX	7,670	XX	13,000	XX	15,800

W Withheld to avoid disclosing company proprietary data. Withheld values included in "Combined values" data. XX Not applicable.

[1]Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

[2]Data are rounded to no more than three significant digits; may not add to totals shown.

[3]Withheld to avoid disclosing company proprietary data.

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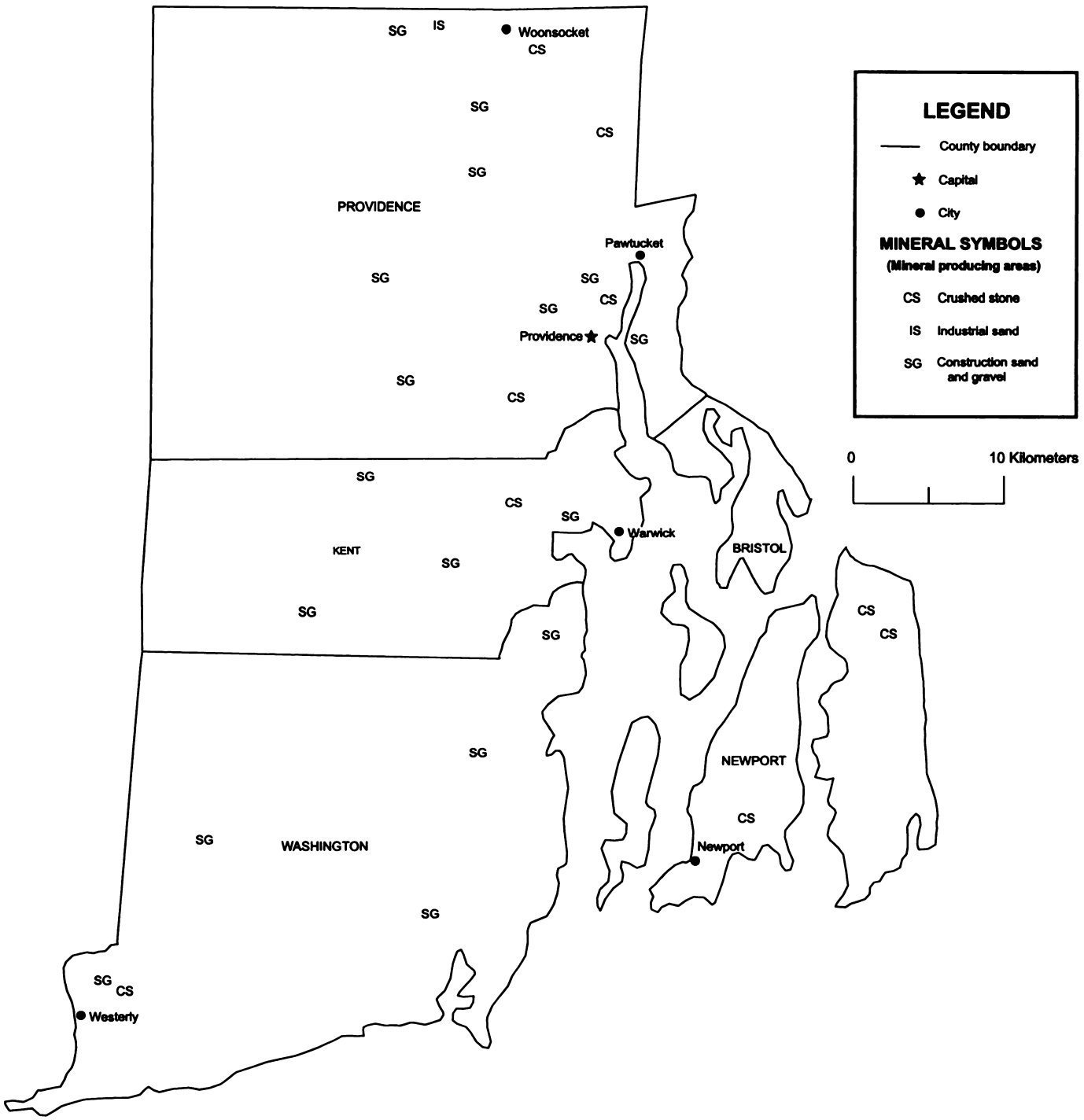
RHODE ISLAND



Source: Rhode Island Geological Survey/U.S. Geological Survey (2005)

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THE MINERAL INDUSTRY OF RHODE ISLAND

In 2005, Rhode Island's nonfuel raw mineral production was valued[1] at $35.4 million, based upon annual U.S. Geological Survey data. This was an increase of 2.9% from the State's total nonfuel mineral value for 2004, which was up about 8.5% from 2003. (The data for industrial sand and gravel and crushed limestone are withheld in table 1 (company proprietary data); the actual total values for 2003-05 are higher than those reported in that table.)

[1]The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2005 USGS mineral production data published in this chapter are those available as of December 2006. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—can be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

Most of Rhode Island's nonfuel mineral production resulted from the mining and production of two basic construction materials—construction sand and gravel and crushed stone. In 2005, these two mineral commodities accounted for about 65% and 35%, respectively, of that portion of the States' nonfuel mineral economy that may be publicly disclosed. Data for crushed granite and crushed traprock are included in tables 1-3.

In 2005, with a slight increase in production, construction sand and gravel rose by $1 million and accounted for all of Rhode Island's increase in nonfuel mineral production value from 2004. Crushed stone production and value remained at 2004 levels. Although industrial sand and gravel production rose more than 25%, its mineral commodity value was unchanged. Gemstones, the value of which was estimated, continued only to be mined in the State by hobbyists.

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN RHODE ISLAND[1, 2]

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral	2003		2004		2005	
	Quantity	Value	Quantity	Value	Quantity	Value
Gemstones	NA	1	NA	1	NA	1
Sand and gravel:						
Construction	2,450	21,000	2,490	22,000	2,510	23,000
Industrial	W	(3)	W	(3)	W	(3)
Stone, crushed	1,340	10,700	1,600 [4]	12,400 [4]	1,610 [4]	12,400 [4]
Total	XX	31,700	XX	34,400	XX	35,400

NA Not available. W Withheld to avoid disclosing company proprietary data. XX Not applicable.

[1]Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

[2]Data are rounded to no more than three significant digits; may not add to totals shown.

[3]Value withheld to avoid disclosing company proprietary data.

[4]Excludes certain stones; value withheld to avoid disclosing company proprietary data.

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TABLE 2
RHODE ISLAND: CRUSHED STONE SOLD OR USED, BY KIND[1]

Kind	2004 Number of quarries	2004 Quantity (thousand metric tons)	2004 Value (thousands)	2005 Number of quarries	2005 Quantity (thousand metric tons)	2005 Value (thousands)
Limestone	1	W	W	1	W	W
Granite	3	503	$4,330	3	455	$3,930
Traprock	3	1,090	8,030	3	1,150	8,510
Total	XX	1,600	12,400	XX	1,610	12,400

W Withheld to avoid disclosing company proprietary data. XX Not applicable.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.

TABLE 3
RHODE ISLAND: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2005, BY USE[1]

(Thousand metric tons and thousand dollars)

Use	Quantity	Value
Unspecified:[2]		
Reported	819	6,670
Estimated	789	5,800
Total	1,610	12,400

[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Reported and estimated production without a breakdown by end use.

TABLE 4
RHODE ISLAND: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2005, BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate and concrete products	1,020	$9,870	$9.69
Asphaltic concrete aggregates and road base materials	250	2,190	8.77
Fill	246	1,890	7.69
Snow and ice control	97	1,020	10.48
Unspecified:[2]			
Reported	204	1,800	8.81
Estimated	689	6,190	8.98
Total or average	2,510	23,000	9.16

[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.
[2]Estimated production without a breakdown by end use.

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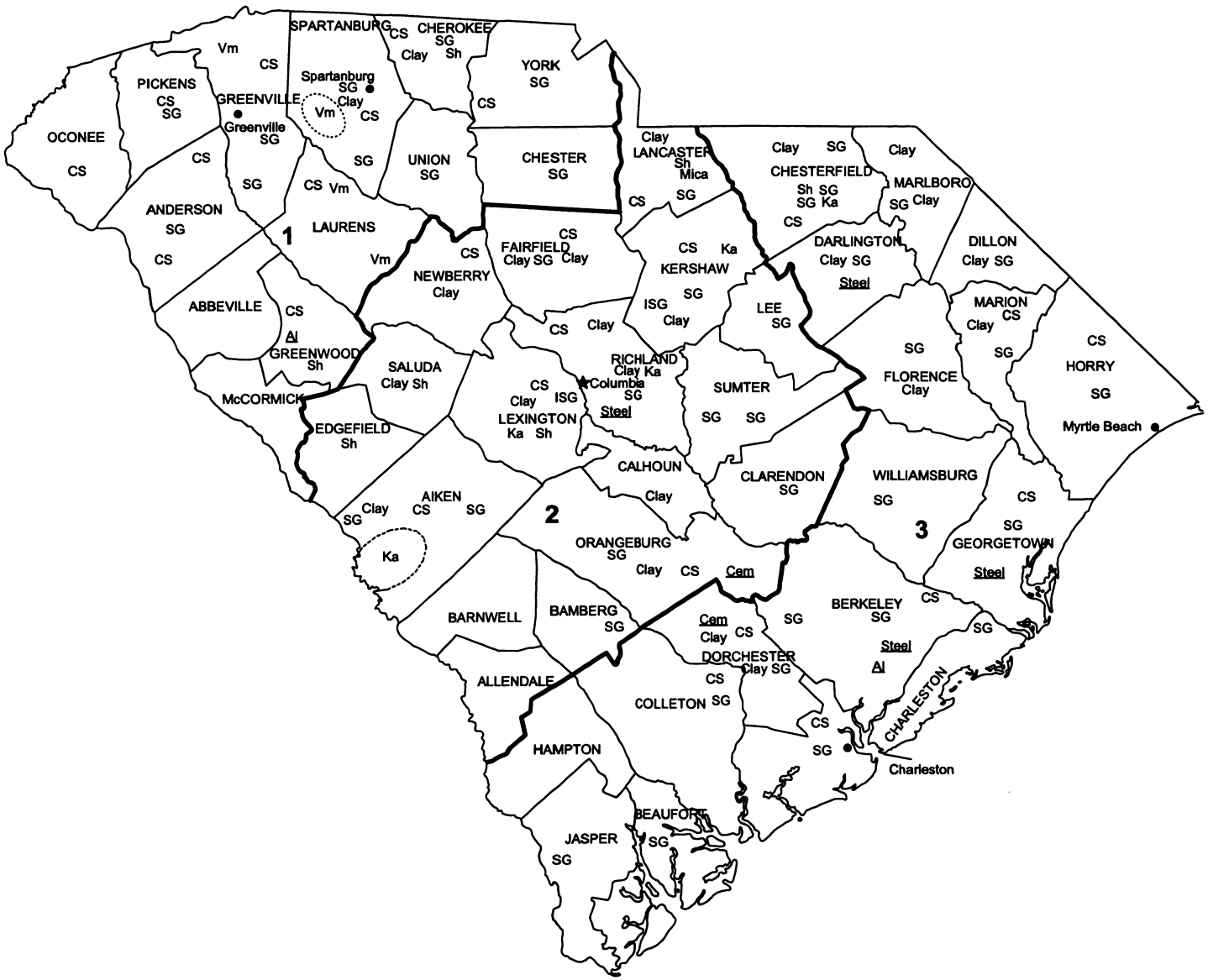
SOUTH CAROLINA



LEGEND

- County boundary
- Capital
- City
- 1 — Crushed stone/sand and gravel districts

MINERAL SYMBOLS (Major producing areas)

Al	Aluminum plant
Cem	Cement plant
Clay	Common clay
CS	Crushed stone
ISG	Industrial sand and gravel
Ka	Kaolin
Mica	Mica
SG	Construction sand and gravel
Sh	Shale
Steel	Steel plant
Vm	Vermiculite
	Concentration of mineral operations

Source: South Carolina Geological Survey/U.S. Geological Survey (2005)

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THE MINERAL INDUSTRY OF SOUTH CAROLINA

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the South Carolina Geological Survey for collecting information on all nonfuel minerals.

In 2005, South Carolina's nonfuel raw mineral production was valued[1] at $659 million, based upon annual U.S. Geological Survey (USGS) data. This was a nearly 24% increase from the State's total nonfuel mineral value of $532 million in 2004, which was up 4.7% from 2003. South Carolina was 28th in rank (27th in 2004) among the 50 States in total nonfuel mineral production value and accounted for more than 1% of the U.S. total. [Because data for mica and vermiculite have been withheld (company proprietary data) for 2004, the actual total value for that year is somewhat higher than that reported in table 1.]

A large majority of South Carolina's nonfuel mineral production resulted from the mining and production of construction minerals and materials. In 2005, cement (portland and masonry), by value, remained the State's leading nonfuel mineral commodity, followed by crushed stone and construction sand and gravel. These three mineral commodities accounted for nearly 92% of the State's total nonfuel mineral value, followed, in descending order of value, by industrial sand and gravel, kaolin, and vermiculite.

In 2005, most of the State's nonfuel mineral commodities increased in value, led in particular by increases (descending order of change) in cement, crushed stone, and construction sand and gravel. Small to moderate increases in the production of the top three commodities resulted in relatively large increases in their values in 2005 from 2004. A 5.6% increase in the production of cement brought about an increase in its value of more than $55 million, up nearly 23% from that of 2004. Similarly, a nearly 8% increase in crushed stone production led to a $48 million increase, up nearly 23% from the previous year. [Although data for crushed marble are withheld (company proprietary data); it may be said both production and subsequent value significantly increased.] Construction sand and gravel value also showed a significant increase; with its production rising more than 11%, the commodity's value increased by $10.1 million, up nearly 29%. Industrial sand and gravel production and value rose more proportionately by slightly more than 10% each, the value of which was up nearly $2 million. Decreases of $1.9 million and $1.5 million, respectively, took place in the commodities of kaolin and vermiculite; dimension stone and gemstones values were unchanged (table 1).

In 2005, South Carolina continued to rank first in the quantities of vermiculite that it produced of two producing States and third of four fire clay-producing States. With cement categorized by type as in table 1, it remained third among producing States in the quantity of masonry cement produced and eighth in the production of portland cement. South Carolina rose to second from third in the production of kaolin, to fourth from fifth in mica, and to eighth from ninth in common clays. Additionally, the State continued to produce significant quantities of crushed stone, construction sand and gravel, and industrial sand and gravel, as compared with other producing States. Primary aluminum and raw steel also were produced in the State but from raw materials that were acquired from foreign and other domestic sources. South Carolina was sixth (fifth in 2004) of 12 States in the production of primary aluminum in 2005.

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[1]The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2005 USGS mineral production data published in this chapter are those available as of December 2006. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—can be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

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TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN SOUTH CAROLINA[1,2]

(Thousand metric tons and thousand dollars)

Mineral	2003		2004		2005	
	Quantity	Value	Quantity	Value	Quantity	Value
Cement:						
Masonry	425	43,700 e	453	49,900 e	498	54,300 e
Portland	3,150	194,000 e	3,110	196,000 e	3,270	247,000 e
Clays:						
Common	1,060	2,660	1,050	3,350	1,020	3,610
Fire	W	W	1	64	54	892
Kaolin	355	21,700	296	19,600	287	17,700
Gemstones	NA	1	NA	1	NA	1
Sand and gravel:						
Construction	10,100	34,700	9,960	35,100	11,100	45,200
Industrial	655	16,700	719	17,600	794	19,400
Stone:						
Crushed	27,300	184,000	31,300	210,000	33,800 [3]	258,000 [3]
Dimension	9	850	9	850	9	850
Combined values of mica (crude), stone (crushed marble [2005]), vermiculite (crude), and value indicated by symbol W	XX	10,100	XX	(4)	XX	12,600
Total	XX	508,000	XX	532,000	XX	659,000

eEstimated. NA Not available. W Withheld to avoid disclosing company proprietary data. Withheld value included in "Combined values" data.
XX Not applicable.

[1]Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

[2]Data are rounded to no more than three significant digits; may not add to totals shown.

[3]Excludes certain stones; kind and value included with "Combined values" data.

[4]Value withheld to avoid disclosing company proprietary data.

TABLE 2
SOUTH CAROLINA: CRUSHED STONE SOLD OR USED, BY KIND[1]

Kind	2004			2005		
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Number of quarries	Quantity (thousand metric tons)	Value (thousands)
Limestone	6	6,410	$32,600	3	3,700	$26,200
Marble	1	W	W	1	(2)	(2)
Calcareous marl	3	W	W	4	4,920	28,200
Granite	23	22,200	163,000	23	25,200	203,000
Total	XX	31,300	210,000	XX	33,800	258,000

W Withheld to avoid disclosing company proprietary data; included in "Total." XX Not applicable.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Withheld to avoid disclosing company proprietary data.

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TABLE 3
SOUTH CAROLINA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2005, BY USE[1]

(Thousand metric tons and thousand dollars)

Use	Quantity	Value
Construction:		
Coarse aggregate (+1½ inch):		
Macadam	W	W
Riprap and jetty stone	W	W
Filter stone	W	W
Total	762	8,400
Coarse aggregate, graded:		
Concrete aggregate, coarse	W	W
Bituminous aggregate, coarse	W	W
Bituminous surface-treatment aggregate	W	W
Railroad ballast	W	W
Other graded coarse aggregates	11	59
Total	6,130	66,600
Fine aggregate (-⅜ inch):		
Stone sand, concrete	(2)	(2)
Screening, undesignated	345	4,240
Other fine aggregates	3,880	24,100
Total	4,220	28,400
Coarse and fine aggregates:		
Graded road base or subbase	(3)	(3)
Crusher run or fill or waste	593	3,790
Other coarse and fine aggregates	3,750	25,600
Total	4,340	29,400
Chemical and metallurgical, cement manufacture	(4)	(4)
Unspecified:[5]		
Reported	16,800	112,000
Estimated	1600	13,000
Total	18,400	125,000
Grand total	33,800	258,000

W Withheld to avoid disclosing company proprietary data; included in "Total."
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Withheld to avoid disclosing company proprietary data; included with "Other fine aggregates."
[3]Withheld to avoid disclosing company proprietary data; included with "Other coarse and fine aggregates."
[4]Withheld to avoid disclosing company proprietary data; included with "Unspecified: Reported."
[5]Reported and estimated production without a breakdown by end use.

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TABLE 4
SOUTH CAROLINA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2005, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Construction:						
Coarse aggregate (+1½ inch)[2]	W	W	W	W	W	W
Coarse aggregate, graded[3]	W	W	W	W	W	W
Fine aggregate (-⅜ inch)[4]	W	W	W	W	W	W
Coarse and fine aggregate[5]	W	W	W	W	W	W
Chemical and metallurgical[6]	--	--	(7)	(7)	--	--
Unspecified:[8]						
Reported	4,040	29,000	4,840	26,400	7,900	56,600
Estimated	--	--	60	475	1,600	12,000
Total	13,900	106,000	7,990	52,700	11,900	99,000

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes filter stone, macadam, and riprap and jetty stone.
[3]Includes bituminous aggregate (coarse), bituminous surface-treatment aggregate, concrete aggregate (coarse), railroad ballast, and other graded coarse aggregates.
[4]Includes screening (undesignated), stone sand (concrete), and other fine aggregates.
[5]Includes crusher run or fill or waste, graded road base or subbase, and other coarse and fine aggregates.
[6]Includes cement manufacture.
[7]Withheld to avoid disclosing company proprietary data; included with "Unspecified: Reported."
[8]Reported and estimated production without a breakdown by end use.

TABLE 5
SOUTH CAROLINA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2005, BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate and concrete products[2]	4,530	$19,900	$4.39
Fill[3]	880	1,780	2.02
Other miscellaneous uses	163	602	3.69
Unspecified:[4]			
Reported	3,190	13,800	4.33
Estimated	2,380	9,180	3.86
Total or average	11,100	45,200	4.06

[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes plaster and gunite sands.
[3]Includes roadbase and coverings.
[4]Reported and estimated production without a breakdown by end use.

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TABLE 6
SOUTH CAROLINA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2005,
BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products[2]	553	3,380	1,690	6,860	2,350	9,800
Fill	--	--	205	474	610	1,120
Other miscellaneous uses	--	--	--	--	163	603
Unspecified[3]						
Reported	22	93	--	--	3,160	13,700
Estimated	--	--	86	332	2,290	8,850
Total	576	3,470	1,980	7,670	8,580	34,100

-- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes plaster and gunite sands and road base materials.

[3]Reported and estimated production without a breakdown by end use.

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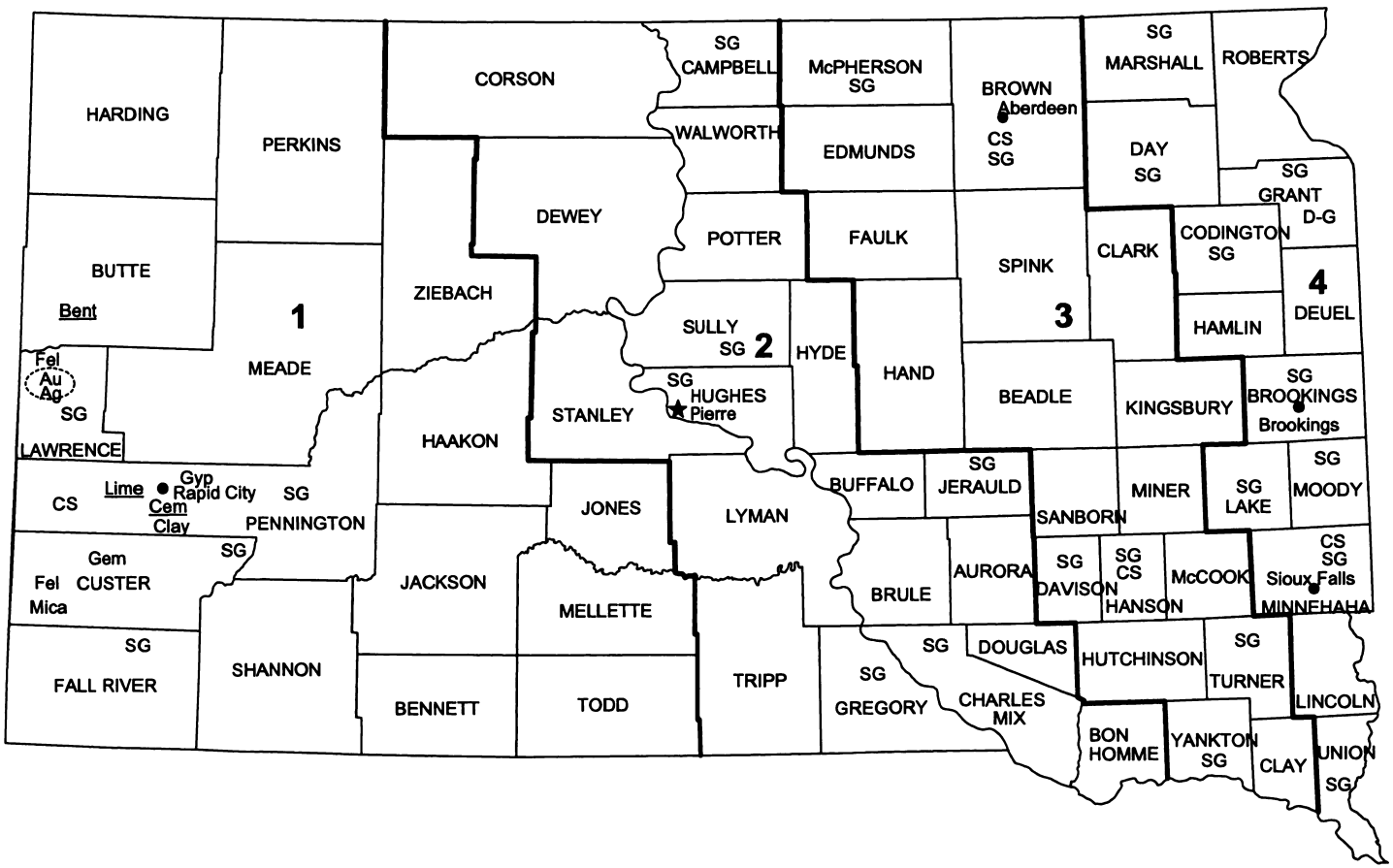
SOUTH DAKOTA



LEGEND

- County boundary
- Capital
- City
- 1 — Crushed stone/sand and gravel districts

MINERAL SYMBOLS (Major producing areas)

Ag	Silver
Au	Gold
Bent	Bentonite mill
Cem	Cement plant
Clay	Common clay
CS	Crushed stone
D-G	Dimension granite
Fel	Feldspar
Gem	Gemstones
Gyp	Gypsum
Lime	Lime plant
Mica	Mica
SG	Construction sand and gravel

Concentration of mineral operations

0 50 Kilometers

Source: South Dakota Geological Survey/U.S. Geological Survey (2005)

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THE MINERAL INDUSTRY OF SOUTH DAKOTA

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the South Dakota Geological Survey for collecting information on all nonfuel minerals.

In 2005, South Dakota's nonfuel raw mineral production was valued[1] at $215 million, based upon annual U.S. Geological Survey (USGS) data. This was a $5 million, or 2.4%, increase from the State's total nonfuel mineral value for 2004, which had increased by $11 million, or was up by 5.5% from 2003 to 2004. South Dakota ranked 39th among the States in total nonfuel mineral production, yet per capita the State ranked 13th in the Nation in the value of its mineral industry's nonfuel mineral production; with a population of nearly 200,000, the value of production was about $277 per capita.

Portland cement, by value, continued to be South Dakota's leading nonfuel mineral commodity in 2005, after having overtaken gold in 2002. (Prior to 2002, gold had been the State's leading mineral commodity for more than 4 decades.) Portland cement was followed by (in descending order of value) construction sand and gravel, crushed stone, gold, granite dimension stone, and lime. The State's production of construction materials, which mainly included (in descending order of value) portland cement, construction sand and gravel, crushed stone, granite dimension stone, common clays, and gypsum, accounted for more than 82% of the State's total nonfuel mineral production value.

Portland cement had the largest increase in value of production of all the State's mineral commodities. With a somewhat small increase in production and a significant increase in unit value, its value rose by about $15 million. A nearly 4% increase in the production of crushed stone resulted in an 11%, or $3 million rise in the mineral commodity's value. These increases were partly offset by decreases in most of the State's other nonfuel mineral production values, the largest of which were in construction sand and gravel, which was down about $6 million, and smaller yet still significant decreases in the values of gold and granite dimension stone production (company proprietary data) (table 1).

In 2005, South Dakota continued to rank seventh in the quantity of gold produced of 11 producing States; it rose to third from fourth of 5 mica-producing States and remained a significant producer of construction sand and gravel and granite dimension stone.

The following narrative information was provided by the South Dakota Department of Environment and Natural Resources[2] (DENR). Production data in the text that follows are those reported by the DENR Minerals and Mining Program (MMP) and are based upon MMP surveys and estimates. Data may differ from some production figures reported to the USGS.

Exploration and Mine Permitting Activities

In 2005, the DENR issued only one nonfuel mineral mining exploration permit. The permit was granted to Dakota Stone Mining & Stone Supply Inc., which planned to explore for building-quality slate in the central Black Hills region. On August 9, Cold Spring Granite Co. submitted a small-scale-mine permit application to expand its existing granite quarry covered under Large Scale Mine Permit No. 8. The 2.75-hectare (ha) (6.8 acre) area was to be used to store granite blocks, and the reclamation plan for the area was that the land be used as cropland. The permit was likely to be granted sometime in 2006.

Gold exploration activities in South Dakota continued to be limited despite higher gold prices. None of the large-scale gold mines conducted exploration activities, and only one placer mining operation reported exploration activities. Wharf Resources (U.S.A.) Inc., which operated a large-scale gold mine located in the Black Hills, completed reclamation activities for 13 exploration permits in 2005, the permits having been issued between 1988 and 1995. A total of 9.7 ha and more than 2,070 drill holes were reclaimed. Close-out inspections were performed by the DENR in 2004 and 2005. In January 2006, based on the recommendation of the DENR, the board released Wharf Resources from liability at these exploration sites.

During 2005, 510 companies and individuals had active mine licenses in South Dakota. An operator was required to obtain a license to mine for sand, gravel, pegmatite minerals (feldspar, mica, rose quartz), materials to be used in the process of making cement or lime, and rock to be crushed and used in construction. Thirty-six mine permits for the mining of other minerals (such as bentonite, dimension stone, placer gold, and slate) were in force, and 11 precious metal mining permits, which included six large-scale gold mining operations, remained current in 2005. Wharf Resources, which operated the only active gold mine in South Dakota, held four of these permits. No new mine permits or mine permit amendments were issued to large-scale gold operations during the year.

[1]The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2005 USGS mineral production data published in this chapter are those available as of December 2006. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—can be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

[2]The DENR Minerals and Mining Program in cooperation with DENR Geological Survey Program provided information. E.H. Holm, T. Cline, Jr., and M. Macy, Natural Resources Project Engineer, Environmental Project Scientist, and Natural Resources Project Engineer, respectively, with the Minerals and Mining Program, jointly authored the text of information provided by that program.

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Commodity Review

Industrial Minerals

Aggregate (Construction Sand and Gravel and Crushed Stone).—Sand and gravel was the major industrial mineral commodity produced during 2005. Based upon aggregate data gathered and compiled by the MMP, 14.7 million metric tons (Mt) (16.2 million short tons) of sand and gravel was produced in South Dakota in 2005. Sand and gravel was produced in nearly every county in the State and were mostly used for road construction projects.

During 2005, Sioux quartzite became the second most produced industrial mineral commodity by weight in the State, at about 3.11 Mt. It was quarried from four locations in the southeastern portion of the State; most of the quartzite was crushed and used in construction. Some larger blocks were used for riprap, railroad ballast, and occasionally for decorative purposes. Limestone was the third most produced commodity, at about 3.06 Mt. Limestone was produced in the Black Hills of western South Dakota and was used primarily in the production of cement and in construction projects.

Dimension Stone.—About 302,000 metric tons (t) of dimension stone was mined by Dakota Granite Co. and Cold Spring Granite Co. from quarries near Milbank in northeastern South Dakota. Because of its beauty and distinctive red color, the "mahogany" granite is used primarily for monuments and building construction; much of it went to international markets.

Other Industrial Minerals.—Minerals produced in smaller amounts during 2005 included iron ore, mica schist, pegmatite minerals (feldspar, mica, rose quartz), placer gold, shale, and slate.

Metals

Gold and Silver.—Gold production and value in South Dakota decreased in 2005. Wharf Resources produced in excess of 1,900 kilograms (kg) of gold in 2005 and was the only company reporting gold production. This represented about a 20% decrease in the amount of gold produced compared with that of 2004. During 2004, nearly all gold production in the State was produced by Wharf Resources; only minor amounts were produced by Homestake Mining Company and by LAC Minerals (USA), LLC. The average price of gold in 2005 was about $445 per troy ounce, yielding a gross value of more than $27 million, lower than the 2004 gross value of about $31 million. During the past several years, all mines had been surface heap-leach operations, with the exception of the Homestake Mine.

Wharf Resources also was the only company to report silver production, which was a byproduct of its gold recovery process. Based upon MMP data, about 5,200 kg (167,000 troy ounces) of silver was recovered in 2005. At an average price of about $7.30 per troy ounce, the value of the silver was slightly more than $1.2 million. This is an increase from the 2,800 kg (89,000 troy ounces) and $596,000 value in 2004.

In early 2005, Wharf Resources' parent company (Goldcorp Inc.) merged with Wheaten River Minerals Ltd. The new company was the lowest-cost (per ounce) million-ounce gold producer in the world. Goldcorp was also among the top six gold producers in North America (South Dakota Department of Environment and Natural Resources Minerals and Mining Program, 2006§[3]).

Mine Reclamation

Homestake completed several reclamation projects at its historic gold mine, the Homestake Mine, in Lead during 2005. The new park in the former mill area was dedicated and opened to the public on June 3. The park included displays of vintage mining equipment, a ¼-mile hiking trail, and a picnic area. The company also completed reclamation of its Yates Waste Rock Facility in August. Slopes were reduced and revegetated to improve the long-term stability and appearance of the facility. Additionally, Homestake sealed and closed several mine tunnels near Lead.

The company also continued work on converting underground portions of the Homestake Mine into a national underground science laboratory. In July, the National Science Foundation selected the Homestake Mine and the Henderson Mine in Colorado as the two finalists for the deep underground science and engineering laboratory, dubbed DUSEL. A decision on which mine would be the preferred site for the DUSEL was to be made at a later date. In September, the State signed an agreement with Barrick Gold Corp. Inc., Homestake's parent company, to turn the underground mine over to the State's Science and Technology Authority. The South Dakota Legislature approved $19.9 million in additional funding during a special session in October to fund the development of an interim lab at the 1,480-meter level of the mine (South Dakota Science and Technology Authority, 2005§).

Government Programs and Activities

Environmental Issues

Gilt Edge Mine Superfund Site.—The U.S. Environmental Protection Agency (EPA) continued acid water treatment at the Gilt Edge Mine Superfund Site. Water treatment resumed on September 29 after some adjustments were made earlier in the year to improve the efficiency of the water-treatment plant. The plant treated 72.3 million liters (L) (19.1 million gallons) in 2005, and water treatment was to continue in 2006.

Over the past few years, the EPA has been conducting a large-scale test to treat water in the Gilt Edge's Anchor Hill Pit using biological processes. pH adjustments were made to the water by adding lime and caustic, ethanol, molasses, and phosphoric acid to enhance the growth of bacteria. The bacteria created conditions for metals precipitation. The goal of the test was to reduce the acidity and heavy-metal concentrations of the water so it could meet water quality standards and be discharged directly without further treatment. The test entered its operational phase in 2004 and the EPA discharged 380,000 L (100,000 gallons) of water from the pit. During

[3]References that include a section mark (§) are found in the Internet References Cited section.

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2005, the EPA discharged 45 million L (12 million gallons) from the pit. Additional discharges were planned for 2006. The process needed additional work before it could be considered an alternative treatment method to the current water-treatment plant.

Near yearend, the leachate collection pond at the toe of the reclaimed (Gilt Edge) Ruby Waste Rock Depository was replaced with an underground vault. Leachate from the toe was to be collected in the new vault and pumped to the water-treatment plant. A new pumphouse was under construction at the toe of the depository; completion was planned for early 2006. The EPA and the State continued to prepare plans for reclaiming the remainder of the site, including the mine pits and heap-leach pad. A feasibility study on reclamation options was scheduled for completion during 2006.

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TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN SOUTH DAKOTA[1, 2]

(Thousand metric tons and thousand dollars)

Mineral	2003		2004		2005	
	Quantity	Value	Quantity	Value	Quantity	Value
Clays, common	213	W	188	W	183	W
Sand and gravel, construction	11,800	44,800	14,000	51,700	12,800	45,500
Stone, crushed	6,880	24,700	6,410 r	27,600 r	6,650	30,600
Combined values of cement (portland), feldspar, gemstones, gold, gypsum (crude), lime, mica (crude), stone (dimension granite), and values indicated by symbol W	XX	130,000	XX	131,000 r	XX	139,000
Total	XX	199,000	XX	210,000 r	XX	215,000

rRevised. W Withheld to avoid disclosing company proprietary data. Withheld values included in "Combined values" data. XX Not applicable.
[1]Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2]Data are rounded to no more than three significant digits; may not add to totals shown.

TABLE 2
SOUTH DAKOTA: CRUSHED STONE SOLD OR USED, BY KIND[1]

Kind	2004			2005		
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Number of quarries	Quantity (thousand metric tons)	Value (thousands)
Limestone	6 r	2,990 r	$9,730 r	6	3,200	$14,800
Granite	1	W	W	1	W	W
Quartzite	9	3,170	17,000	4	3,210	14,800
Slate	1	W	W	1	W	W
Total	XX	6,410 r	27,600 r	XX	6,650	30,600

rRevised. W Withheld to avoid disclosing company proprietary data; included in "Total." XX Not applicable.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.

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TABLE 3
SOUTH DAKOTA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2005, BY USE[1]

(Thousand metric tons and thousand dollars)

Use	Quantity	Value
Construction:		
Coarse aggregate (+1½ inch), other	W	W
Coarse aggregate, graded, other	W	W
Fine aggregate (-⅜ inch), other	W	W
Coarse and fine aggregates, other	W	W
Chemical and metallurgical:		
Cement manufacture	W	W
Lime manufacture	W	W
Unspecified:[2]		
Reported	4,070	$18,700
Estimated	241	1,100
Total	4,310	19,800
Grand total	6,650	30,600

W Withheld to avoid disclosing company proprietary data; included in "Grand total."
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Reported and estimated production without a breakdown by end use.

TABLE 4
SOUTH DAKOTA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2005, BY USE AND DISTRICT[1, 2]

(Thousand metric tons and thousand dollars)

	District 1		District 3		District 4	
Use	Quantity	Value	Quantity	Value	Quantity	Value
Construction:						
Coarse aggregate (+1½ inch)[3]	W	W	--	--	--	--
Coarse aggregate, graded[4]	W	W	--	--	--	--
Fine aggregate (-⅜ inch)[5]	W	W	--	--	--	--
Coarse and fine aggregate[6]	W	W	--	--	--	--
Chemical and metallurgical[7]	W	W	--	--	--	--
Unspecified:[8]						
Reported	855	3,980	493	2,270	2,720	12,500
Estimated	--	--	--	--	241	1,100
Total	3,200	14,800	493	2,270	2,960	13,600

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]No crushed stone produced in District 2.
[3]Includes other coarse aggregate.
[4]Includes other graded coarse aggregate.
[5]Includes other fine aggregate.
[6]Includes other coarse and fine aggregate.
[7]Includes cement and lime manufacture.
[8]Reported and estimated production without a breakdown by end use.

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TABLE 5
SOUTH DAKOTA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2005,
BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)[2]	515	$2,720	$5.29
Asphaltic concrete aggregates and other bituminous mixtures	653	2,400	3.67
Road base and coverings[3]	5,090	15,500	3.04
Fill	291	790	2.71
Snow and ice control	26	80	3.08
Other miscellaneous uses	29	228	7.86
Unspecified:[4]			
Reported	2,440	10,300	4.20
Estimated	3,800	13,500	3.59
Total or average	12,800	45,500	3.55

[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes plaster and gunite sands.
[3]Includes road and other stabilization (lime).
[4]Reported and estimated production without a breakdown by end use.

TABLE 6
SOUTH DAKOTA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2005,
BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregates (including concrete sand)[2]	W	W	W	W	W	W
Asphaltic concrete aggregates and other bituminous mixtures	--	--	W	W	W	W
Road base and coverings[3]	W	W	W	W	270	767
Fill	--	--	8	8	52	142
Other miscellaneous uses[4]	219	776	205	1,270	90	418
Unspecified:[5]						
Reported	247	938	112	246	310	1,510
Estimated	1,200	4,200	1,500	5,500	600	2,200
Total	1,640	5,910	2,020	7,370	1,350	5,070

Use	District 4		Unspecified districts	
	Quantity	Value	Quantity	Value
Concrete aggregates (including concrete sand)[2]	280	1,300	--	--
Asphaltic concrete aggregates and other bituminous mixtures	607	2,200	--	--
Road base and coverings[3]	4,210	13,000	236	649
Fill	232	641	--	--
Other miscellaneous uses[4]	28	164	--	--
Unspecified:[5]				
Reported	1,770	7,570	--	--
Estimated	500	1,600	--	--
Total	7,590	26,500	236	649

W Withheld to avoid disclosing company proprietary data; included in "Other miscellaneous uses." -- Zero.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes plaster and gunite sands.
[3]Includes road and other stabilization (lime).
[4]Includes snow and ice control.
[5]Reported and estimated production without a breakdown by end use.

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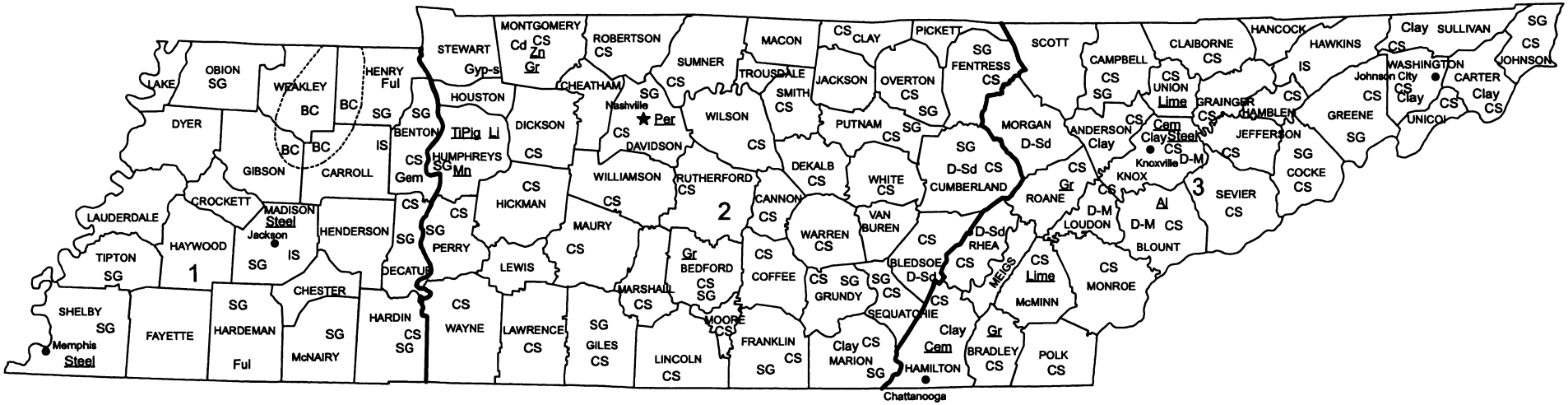
TENNESSEE



LEGEND

- County boundary
- Capital
- City
- 1 Crushed stone/sand and gravel districts

MINERAL SYMBOLS (Major producing areas)

AI	Aluminum plant	D-M	Dimension marble	IS	Industrial sand	Steel	Steel plant
BC	Ball clay	D-Sd	Dimension sandstone	Li	Lithium plant	TiPig	Titanium dioxide pigment plant
Cd	Cadmium (See Zn)	Ful	Fuller's earth	Lime	Lime plant	Zn	Zinc plant (Cd byproduct cadmium)
Cem	Cement plant	Gem	Gemstones	Mn	Manganese dioxide plant		
Clay	Common clay and shale	Gr	Graphite plant	Per	Perlite plant		Concentration of mineral operations
CS	Crushed stone	Gyp-s	Synthetic gypsum	SG	Construction sand and gravel		

0 50 Kilometers

Source: Tennessee Department of Environment and Conservation, Division of Geology/U.S. Geological Survey (2005)

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THE MINERAL INDUSTRY OF TENNESSEE

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Tennessee Department of Environment and Conservation, Division of Geology for collecting information on all nonfuel minerals.

In 2005, Tennessee's nonfuel raw mineral production was valued[1] at $770 million, based upon annual U.S. Geological Survey (USGS) data. This was a $118 million or 18.1% increase from the State's total nonfuel mineral production value of 2004, following a 4.7% increase from that of 2003. Tennessee was 26th in rank (24th in 2004) among the 50 States in total nonfuel mineral production value and accounted for 1.4% of the U.S. total.

Crushed stone has been Tennessee's leading nonfuel mineral commodity, by value, for nearly five decades (except in 1981 when zinc was first); crushed stone went ahead of cement (portland and masonry) in 1957. In 2005, crushed stone accounted for nearly 63% of the State's total nonfuel mineral production value. Cement was the second-leading nonfuel mineral commodity, followed by construction sand and gravel, ball clay, industrial sand and gravel, and lime.

The largest increases in nonfuel mineral value in 2005 came from the production of crushed stone and cement, the unit values of each showing significant increases. Crushed stone production increased by more than 10%, while its resultant value rose by $101 million, or by nearly 27%. Cement production also showed a relatively small increase (company proprietary data), while the commodity's value rose by more than 12% (table 1). Smaller yet significant increases took place in the values of construction sand and gravel, up by $4 million, or more than 8% (with a small decrease in production), and lime, up by nearly $1.5 million (production also down slightly). The only substantial decrease in value took place in zinc owing to the April 2004 closing of the State's only remaining active zinc mine, Pasminco Ltd.'s (of Australia) Clinch Valley Mine in Grainger County, TN.

In 2005, Tennessee continued to be the leading ball clay- and gemstone-producing State, 8th in the quantity of fuller's earth produced, and 10th in crushed stone. The State remained a producer of substantial quantities of portland cement, industrial sand and gravel, lime, and common clays (in descending order of value). Primary aluminum and raw steel were produced in Tennessee but were processed from materials obtained from other domestic and foreign sources. The State ranked seventh (sixth in 2004) in the production of primary aluminum.

[1]The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity. All 2005 USGS mineral production data published in this chapter are those available as of December 2006. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—can be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

The Tennessee Division of Geology[2] (TDG) provided the following narrative information. Data and information in the following text are those reported by the TDG, based upon its own surveys and estimates. By yearend 2004, approximately 330 nonfuel mineral operations were permitted in 82 counties across the State.

Commodity Review

Industrial Minerals

Clay and Shale.—There was no change in the number of clay mines or companies operating in the State from the previous year. Ball clay and kaolin were mined from the Eocene-age Claiborne and Wilcox Formations in Carroll, Gibson, Henry, and Weakly Counties, northwest Tennessee. Companies operating in the State were Boral Bricks Inc., H.C. Spinks Clay Company Inc. (owned by Franklin Minerals Inc.), Kentucky-Tennessee Clay Co. (a member of IMERYS Minerals Ltd.), Old Hickory Clay Co., and United Clay Product Inc. (owned by the Unimin Corp.). Fuller's earth (montmorillonite) was mined in Hardeman County by Moltan Co. and in Henry County by American Colloid Co.

General Shale Brick, Inc. (the U.S. subsidiary of Wienerberger AG located in Vienna, Austria) operated seven shale mines in Anderson, Carter, Knox, Sullivan, and Washington Counties in east Tennessee to supply its brick production plants. General Shale Brick broke ground on a new corporate headquarters in Johnson City, TN (General Shale Brick, Inc., 2005a§).

In December, General Shale Brick announced plans to build another concrete block plant in Knoxville, TN. Combined with the company's concrete block plants in Piney Flats, TN, and Louisville, KY, the new plant will bring General Shale's block production to more than 30 million units annually (General Shale Brick, Inc., 2005b§). Two other companies operated two shale mines in Hamilton and Marion Counties in southeast Tennessee.

Crushed Stone and Dimension.—The crushed stone industry operated 157 quarries in 2005. Dolomite and limestone were produced at 154 quarries and underground mines located primarily in District 2 (middle Tennessee) and District 3 (east Tennessee). Three quarries in Johnson County produced crushed granite and quartzite. Crushed limestone and dolomite were produced in 66 counties by 45 different companies and 15 county highway departments. Vulcan Materials Co. operated 37 quarries in 29 counties, Rogers Group Inc. operated 25 quarries in 23 counties, and Rinker Materials operated 12 quarries in 7 counties.

[2]Peter Lemiszki, Chief Geologist with the Tennessee Division of Geology in Knoxville authored the text of the State mineral industry information provided by that agency.

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Holston limestone was quarried for dimension marble in Blount, Knox, and Loudon Counties by Tennessee Marble Co. and Tennessee Valley Marble Inc. Six companies operated eight dimension sandstone quarries in the Pennsylvanian Crab Orchard Sandstone in Bledsoe, Cumberland, Morgan, and Rhea Counties.

Gemstones.—The freshwater pearl was designated the official Tennessee State gem in 1979. On April 12, 2005, the historic Tennessee River Freshwater Pearl Farm and Museum located in Benton County was designated the official site of freshwater pearl culturing in the State of Tennessee (Tennessee River Freshwater Pearl, 2004§[3]). The American Pearl Co. operated the only freshwater pearl farm in North America.

American Shell Co., Tennessee Shell Co., and The American Pearl Co. exported mollusk shells from the Tennessee River to pearl-producing countries. Approximately 90% of all cultured pearls begin with a mother-of-pearl nucleus taken from the shell of a Tennessee mussel.

Sand and Gravel, Construction.—Construction sand and gravel was produced at 94 sites located in 29 counties and operated by 58 different companies, which was similar to the situation in 2004. Companies operating at least five sites each were Ford Construction Co., Memphis Stone and Gravel Co., and Standard Construction Co. located in District 1 (west Tennessee). Industrial sand was mined in Hawkins County by Short Mountain Silica Co. and Fine Sands, LLC. Unimin Corp. operated two industrial sand mines in Benton County, and Teague Transports, LLC. operated one mine in Madison County.

Other Industrial Minerals.—Synthetic gypsum was produced from Tennessee Valley Authority byproducts at the Allied Custom Gypsum plant in Stewart County. Lime plants operated by Bowater Southern Paper Corp. in McMinn County produced high-calcium quicklime, and Global Stone Tenn-Luttrell Co. in Union County produced high-calcium quicklime and hydrated lime. In May 2005, Oglebay Norton Co. completed the unification of its Global Stone Tenn Luttrell Co. operations under the name O-N Minerals (Oglebay Norton Co., 2005§).

Metals

Zinc.—Zinc mining and processing operations continued to be suspended in all of Tennessee's zinc mines. There were no plans to reopen the mines in the Mascot-Jefferson City district. Zinifex Limited operated the electrolytic zinc plant in Clarksville (Montgomery County). Production increased by 7.5% to 115,000 metric tons per year. The Clarksville zinc plant also produced cadmium and sulfuric acid.

Awards

Rogers Group Hillsboro Quarry in Hillsboro, TN, received the 2005 National Stone, Sand & Gravel Association Showplace Award for superior performance in plant beautification (Rogers Group, Inc. 2005a§). In addition, Rogers Group's Northern Middle Tennessee Division received the 2005 National Stone, Sand & Gravel Association Community Achievement Award (Rogers Group, Inc. 2005b§).

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[3]References that include a section mark (§) are found in the Internet References Cited section.

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN TENNESSEE[1,2]

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral	2003		2004		2005	
	Quantity	Value	Quantity	Value	Quantity	Value
Clays:						
Ball	766	33,400	762	34,300	740	32,500
Common	304	585	365	3,140	372	3,210
Fuller's earth	92 e	5,000 e	W	W	W	W
Sand and gravel:						
Construction	7,550	44,100	7,830	47,500	7,570	51,500
Industrial	961	21,800	975	26,100	985	26,500
Stone, crushed	55,100	354,000	57,900	381,000	63,900	482,000
Combined values of cadmium (byproduct in zinc concentrates [2004]), cement, clays (kaolin), gemstones, lime, salt, stone (dimension marble), zinc (2003-04), and values indicated by symbol W	XX	164,000	XX	160,000	XX	174,000
Total	XX	623,000	XX	652,000	XX	770,000

[e]Estimated. W Withheld to avoid disclosing company proprietary data. Withheld values included in "Combined values" data. XX Not applicable.
[1]Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2]Data are rounded to no more than three significant digits; may not add to totals shown.

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TABLE 2
TENNESSEE: CRUSHED STONE SOLD OR USED, BY KIND[1]

Kind	2004 Number of quarries	2004 Quantity (thousand metric tons)	2004 Value (thousands)	2005 Number of quarries	2005 Quantity (thousand metric tons)	2005 Value (thousands)
Limestone[2]	109	55,600	$365,000	110	62,900	$474,000
Dolomite	5	1,640	12,300	1	W	W
Granite	1	483	2,230	1	515	3,880
Sandstone	1	217	2,030	1	W	W
Total	XX	57,900	381,000 r	XX	63,900	482,000

rRevised. W Withheld to avoid disclosing company proprietary data; included in "Total." XX Not applicable.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes limestone-dolomite reported with no distinction between the two.

TABLE 3
TENNESSEE: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2005, BY USE[1]

(Thousand metric tons and thousand dollars)

Use	Quantity	Value
Construction:		
Coarse aggregate (+1½ inch):		
Riprap and jetty stone	935	6,800
Filter stone	777	4,470
Other coarse aggregate	739	6,120
Total	2,450	17,400
Coarse aggregate, graded:		
Concrete aggregate, coarse	321	2,030
Bituminous aggregate, coarse	12,200	92,800
Bituminous surface-treatment aggregate	W	W
Railroad ballast	W	W
Other graded coarse aggregate	5,470	44,300
Total	18,500	142,000
Fine aggregate (-⅜ inch):		
Stone sand, concrete	1,960	17,400
Stone sand, bituminous mix or seal	(2)	(2)
Screening, undesignated	2,400	18,000
Other fine aggregate	1,500	12,900
Total	5,860	48,300
Coarse and fine aggregates:		
Graded road base or subbase	8,980	53,700
Unpaved road surfacing	W	W
Crusher run or fill or waste	968	6,240
Roofing granules	W	W
Other coarse and fine aggregates	6,340	46,300
Total	16,300	106,000
Other construction materials	189	1,220
Agricultural limestone	251	2,070
Chemical and metallurgical:		
Cement manufacture	(3)	(3)
Lime manufacture	(3)	(3)
Sulfur oxide removal	(3)	(3)
Special:		
Mine dusting or acid water treatment	(3)	(3)
Other fillers of extenders	(3)	(3)
Unspecified:[4]		
Reported	10,400	79,400
Estimated	8,100	61,000
Total	18,600	141,000
Grand total	63,900	482,000

W Withheld to avoid disclosing company proprietary data; included in "Total."
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Withheld to avoid disclosing company proprietary data; included with "Other fine aggregates."
[3]Withheld to avoid disclosing company proprietary data; included in "Grand total."
[4]Reported and estimated production without a breakdown by end use.

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TABLE 4
TENNESSEE: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2005, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Construction:						
Coarse aggregate (+1½ inch)[2]	W	W	1,220	7,430	W	W
Coarse aggregate, graded[3]	W	W	W	W	8,270	62,000
Fine aggregate (-⅜ inch)[4]	W	W	W	W	3,650	30,800
Coarse and fine aggregates[5]	W	W	8,780	57,100	W	W
Other construction materials	--	--	189	1,220	--	--
Agricultural[6]	W	W	W	W	W	W
Chemical and metallurgical[7]	--	--	W	W	W	W
Special[8]	--	--	--	--	W	W
Unspecified:[9]						
Reported	641	4,600	7,290	55,800	2,500	19,000
Estimated	--	--	5,900	45,000	2,200	17,000
Total	4,760	38,800	34,000	246,000	25,100	197,000

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes filter stone, riprap and jetty stone, and other coarse aggregates.

[3]Includes bituminous aggregate (coarse), bituminous surface-treatment aggregate, concrete aggregate (coarse), railroad ballast, and other graded coarse aggregates.

[4]Includes screening (undesignated), stone sand bituminous mix or seal, stone sand (concrete), and other fine aggregates.

[5]Includes crusher run or fill or waste, graded road base or subbase, roofing granules, unpaved road surfacing, and other coarse and fine aggregates.

[6]Includes agricultural limestone.

[7]Includes cement manufacture, lime manufacture, and sulfur oxide removal.

[8]Includes mine dusting or acid water treatment and other fillers or extenders.

[9]Reported and estimated production without a breakdown by end use.

TABLE 5
TENNESSEE: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2005,
BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)[2]	3,110	$22,800	$7.32
Concrete products (blocks, bricks, pipe, decorative, etc.)	126	628	4.98
Asphaltic concrete aggregates and other bituminous mixtures	788	5,170	6.56
Road base and coverings	540	2,760	5.10
Fill	276	2,530	9.17
Other miscellaneous uses	29	186	6.41
Unspecified:[3]			
Reported	899	6,060	6.74
Estimated	1,800	11,400	6.30
Total or average	7,570	51,500	6.80

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes plaster and gunite sands.

[3]Reported and estimated production without a breakdown by end use.

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TABLE 6
TENNESSEE: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2005, BY USE AND DISTRICT[1, 2]

(Thousand metric tons and thousand dollars)

Use	District 1		Districts 2 and 3	
	Quantity	Value	Quantity	Value
Concrete aggregates and concrete products[3]	1,880	13,600	1,360	9,790
Asphaltic concrete aggregates and road base materials	738	3,710	590	4,220
Fill	135	1,200	141	1,330
Other miscellaneous uses	--	--	29	186
Unspecified:[4]				
Reported	896	6,020	2	41
Estimated	1,300	8,000	500	3,400
Total	4,910	32,500	2,670	19,000

W Withheld to avoid disclosing company proprietary data; included in "Other miscellaneous uses."
-- Zero.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Districts 2 and 3 are combined to avoid disclosing company proprietary data.
[3]Includes plaster and gunite sands.
[4]Reported and estimated production without a breakdown by end use.

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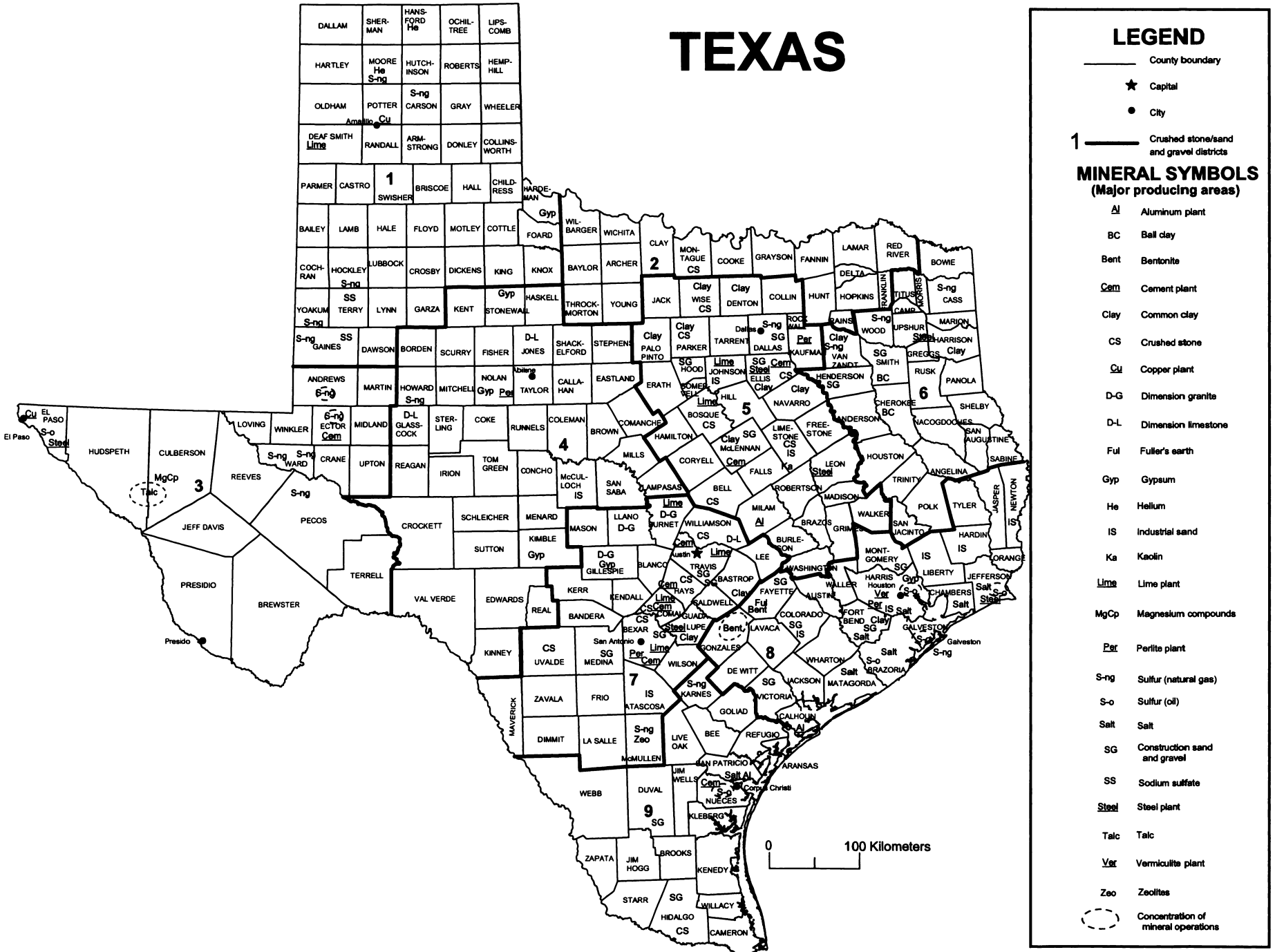

Source: University of Texas at Austin, Bureau of Economic Geology/U.S. Geological Survey (2005)

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THE MINERAL INDUSTRY OF TEXAS

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the University of Texas at Austin, Bureau of Economic Geology, for collecting information on all nonfuel minerals.

In 2005, Texas nonfuel raw mineral production was valued[1] at $2.72 billion, based upon annual U.S. Geological Survey (USGS) data. This was a 16.7% increase from the State's total nonfuel mineral value of $2.33 billion[2] for 2004, which followed a 6.4% increase from 2003 to 2004. Texas was sixth among the 50 States (fifth in 2004) in total nonfuel mineral production value and accounted for nearly 5% of the U.S. total value.

In 2005, about 97% of Texas' nonfuel mineral value resulted from the production of the State's top six industrial minerals, which are, in descending order of value—cement (portland and masonry), crushed stone, construction sand and gravel, salt, industrial sand and gravel, and lime. Cement alone accounted for nearly 37% of Texas' total nonfuel mineral value and together with the State's other two major construction nonfuel minerals, crushed stone and construction sand and gravel, accounted for more than 84% of the same total value. Leading the way with the largest increases in nonfuel mineral value were the same three mineral commodities—crushed stone, up $202 million; cement, up about $162 million (portland cement, up $151 million); and construction sand and gravel, up $36 million. With crushed stone production up nearly 10%, its unit value rose by 21%. Cement production rose a more moderate 4%, while its overall value rose 19%. While construction sand and gravel production decreased slightly more than 1%, the commodity's value rose by more than 8%.

Also up in production and value were industrial sand and gravel, value up $5 million, Grade–A helium, up more than $2 million, and ball clay and fuller's earth, each up about $1 million each. The most substantial decreases in value took place in the those of gypsum, down $7 million, lime and dimension stone, down about $3 million each, and crude helium, down more than $2 million.

In 2005, Texas was the only State that produced brucite and it continued to be first in rank among producing States in the quantity of crushed stone produced; second in the production of portland cement, salt, industrial sand and gravel, crude helium (of two producing States), ball clay, and talc (listed in descending order of value); third in zeolites; fifth in lime; seventh in masonry cement and dimension stone, and ninth in fuller's earth. Also, the State was a significant producer of gemstones. While the State rose in rank to first from second in the production of common clays and to seventh from eighth in bentonite, it decreased to third from second in construction sand and gravel and to seventh from second in the production of gypsum. The Texas metal industry produced primary aluminum, raw steel, refined copper, and smaller amounts of other metals. Sources of plant feed included ores, blister and anode copper, and scrap metal acquired from foreign or other domestic sources. In 2005, the State continued to be third in rank in primary aluminum production and was the leading producer of electrolytically refined copper. Texas also remained one of the Nation's leading raw steel-producing States (precise rank withheld owing to proprietary data of producers in other States). Production of raw steel decreased 11% in 2005 with an output of 3.51 million metric tons (Mt) down from 3.95 Mt in 2004, as reported by the American Iron and Steel Institute (2006, p. 74).

The following narrative information includes information provided by the Texas Bureau of Economic Geology[3] (BEG). In 2005, the mineral industry, as monitored by the BEG, remained a significant and diverse component of the Texas economy with a considerable majority of the State's nonfuel minerals achieving increases in production and value from 2004. Annual job growth in natural resources and mining, as reported by the Texas Workforce Commission (2006§[4]), increased 2.7% from December 2004 through December 2005. This number includes mining and support services for nonfuel minerals as well as oil and gas extraction and coal mining. Steady though modest gains were made in the growth of construction industry employment. The Commission reported an increase of about 3.2% in the number of jobs Statewide in 2005 showing continued steady growth from the 1.2% increase of 2004 and the 0.5% increase of 2003 from that of 2002.

Exploration and Development

According to the BEG, minerals exploration and resource development has been gradually increasing in Texas during the past several years. Several companies were seeking to expand current operations and to acquire additional properties with mineral resources to develop; also, the State agency anticipated the rate of company consolidations would be on the increase during the next several years.

In addition to work in the industrial minerals sector, preparations continued in the early development of the State's

[1]The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2005 USGS mineral production data published in this chapter are those available as of December 2006. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—can be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

[2]This figure is a revision to the previously published $2.29 billion in the The Mineral Industry of Texas chapter in the U.S. Geological Survey Minerals Yearbook, Area Reports: Domestic 2004 Volume II, resulting from a revision in crushed stone value from $582 million to $621 million (table 1).

[3]Sigrid Clift, Research Associate, Texas Bureau of Economic Geology, and J. Richard Kyle, Professor, Department of Geological Sciences, both of the John A. and Katherine G. Jackson School of Geosciences, University of Texas at Austin, coauthored the text of the State mineral industry information provided by the Texas Bureau of Economic Geology.

[4]References that include a section mark (§) are included in the Internet References Cited section.

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first significant metal mining operation in recent years, Silver Standard Resources, Inc.'s Shafter silver mine project. Except for the extraction of magnesium chloride from seawater and from subsurface brine to produce magnesium metal, producing as recently as 1998, no major nonfuel mineral metal mining operation has been active in Texas since the Lone Star Steel Co. terminated operations at its Cass County iron ore mine and sintering plant in the mid-1980s (White and Garner, 1992, p. 480). The mining of Texas iron ores to produce steel was discontinued in 1985 and 1986, accompanied by the closure of several steel mills in 1986. From 1987 through 1994 small quantities of iron ore were produced, but only for industrial use in nonmetal markets, such as cattle feed nutrient, road aggregate, and the manufacture of cement.

Silver Standard continued preparatory work for its underground silver mine, located in the Shafter district in Presidio County in southwest Texas (Trans-Pecos region), 32 kilometers (km) north of the Mexican border and 64 km south of the City of Marfa. As outlined by the company, the Shafter Silver Project had a measured reserve of 0.6 Mt averaging 339 grams per ton (g/t) (nearly 10 troy ounces per short ton) silver and an indicated reserve of 1.29 Mt averaging 348 g/t, along with additional inferred resources. Based upon the company's scoping study, Shafter could be mined at a rate as high as 295,000 metric tons of ore per year initially producing about 99,500 kilograms (kg) (3.2 million troy ounces) of silver per year with average production at nearly 80,900 kg (2.6 million troy ounces) of silver during a mine life of about 7 years (Silver Standard Resources, Inc., 2007§). In addition to the silver mineralization at Shafter, there are zinc, as well as copper and some minor gold occurrences farther to the west that are potential targets for exploration (Silver Standard Resources, Inc., 2001b). Silver Standard held all permits required to commence production at Shafter and planned further evaluation of the Shafter site, including updates of the operating and capital costs of the scoping study; the company planned to renew all mining permits as they come up for renewal (Silver Standard Resources, Inc., 2007§). During 2005, Silver Standard began ground water investigations to evaluate mine de-watering plans and mine needs for process water. The mine hoist, installed by Goldfields Mining Corp. in the late 1970s as part of its exploration activities at the Shafter deposit, was inspected to evaluate its potential for modifications that would allow for the company's planned production rates. Although interest had been high by Goldfields for opening a silver mine at the Shafter deposit and start production in early 1981, the decline in prices for silver (and most other metals) in 1981 caused the company to curtail operations. [U.S. Department of the Interior (U.S. Bureau of Mines (USBM) and USGS) Minerals Yearbooks (MYB) were used to research Texas metal production information for various years. Minerals Yearbooks for 1932-1993, are available over the Internet courtesy of the University of Wisconsin Ecology and Natural Resources Collection and may be accessed online at URL http://minerals.usgs.gov/minerals/pubs/usbmmyb.html. The MYB's for 1994 (USBM) and 1995-present (USGS) may be accessed online by way of URL http://minerals.usgs.gov/minerals/pubs/myb.html.]

Silver Standard had previously in 2003 completed transport to Shafter of a used 725 ton-per-day (800 short ton-per-day) mill, the components of which it had purchased from American Reclamation, Inc. The previous owner, Sunshine Mining and Refining Co., last operated the mill, the 16:1 mill, at its former silver mine in Silver Peak, NV. Silver Standard purchased the used components to help reduce overall capital costs of the project and thereby lower the price of silver at which the company could economically put the mine into production.

The Shafter District area had been mined for silver since the 1880s and was host to the largest known silver deposit in Texas. From 2.1 Mt of ore extracted at the Shafter deposit, total recorded production from the property was nearly 1.1 million kg (35 million troy ounces) of silver. The deposit was mined from 1883 through September 1942 when the Presidio Mine closed down in part owing to labor difficulties, excessive water in lower levels, a lowering of ore grade, and depletion of ore reserves. The last substantial quantities of silver produced in the State came from the old Hazel Mine in Culberson County in 1947, after which silver production tailed off (Martin, 1949, p. 1507). Most of the permitting for the current Shafter project was completed in 2001, and the project has been awaiting higher silver prices for a final feasibility study to be completed. A major road, U.S. Highway 67, and a major powerline traverse the property; the nearby town of Shafter has 30 to 40 inhabitants (Silver Standard Resources, Inc. 2001a§).

Commodity Review

Industrial Minerals

Cement and Crushed Stone.—Hanson Building Materials America opened a major new crushed stone facility in Bridgeport, Wise County, northwest of Dallas, in January. Hanson also sold its 50% interest in Campbell Concrete and Materials, L.P., a ready-mixed concrete business operating in Houston to its joint-venture partner, Lehigh Cement Co., a wholly owned subsidiary of Heidelberg Cement AG (Clift and Kyle, 2006, p. 115). Southern Star Concrete, Inc. was acquired by two South American companies, Compañía de Cemento Argos S.A. ("Argos") and Cementos del Caribe S.A. ("Caribe"). Concerns were raised about how concrete and cement supplies might be affected under the companies' new management and direction.

Common Clays.—Rockwood Holdings, Inc. parent company of Southern Clay Products, Inc. of Gonzales, TX, acquired the rheological additives and carbonless developers businesses of Süd-Chemie AG, Munich, Germany. These businesses will be incorporated into Rockwood's Clay Additives business unit that includes Southern Clay Products.

Environmental Issues

"Sentinels of Safety Awards," cosponsored by the U.S. Department of Labor's Mine Safety and Health Administration (MSHA) and the National Mining Association (NMA), were made to Stonewall Materials of Oklahoma LLC's quarry in Palo Pinto County, Mineral Wells, TX, in the small company category, and with "Special Safety Recognition" to Texas Crushed Stone Co. Inc.'s Georgetown Quarry and Plant operation in Williamson County, Georgetown, TX, and Fordyce

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Ltd.'s Briggs Plant dredge operation in Victoria County, Victoria, TX (National Mining Association, 2005§).

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TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN TEXAS[1,2]

(Thousand metric tons and thousand dollars)

Mineral	2003		2004		2005	
	Quantity	Value	Quantity	Value	Quantity	Value
Cement:						
Masonry	307	36,100 e	319	38,000 e	395	48,500 e
Portland	11,100	747,000 e	11,200	800,000 e	11,600	951,000 e
Clays:						
Common	2,110	8,890	2,160	8,890	2,340	8,680
Fuller's earth	27	2,400	W	W	W	W
Kaolin	33	7,150	W	W	W	W
Gemstones	NA	201	NA	201	NA	201
Gypsum, crude	1,810	12,300	2,450	18,800	1,540	11,800
Lime	1,630	110,000	1,630	115,000	1,610	112,000
Salt	9,640	116,000	9,870	118,000	9,600	118,000
Sand and gravel:						
Construction	86,200	425,000	81,700	436,000	80,700	472,000
Industrial	1,930	81,700	2,790	109,000	2,840	114,000
Stone:						
Crushed	126,000	595,000	122,000	621,000 r	134,000	823,000
Dimension	87	16,400	64	15,200	44	12,200
Talc, crude	246	W	258	W	W	W
Combined values of brucite, clays (ball, bentonite), helium, zeolites (2004-05), and values indicated by symbol W	XX	33,300	XX	46,300	XX	49,300
Total	XX	2,190,000	XX	2,330,000 r	XX	2,720,000

eEstimated. rRevised. NA Not available. W Withheld to avoid disclosing company proprietary data. Withheld values included in "Combined values" data. XX Not applicable.

[1]Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

[2]Data are rounded to no more than three significant digits; may not add to totals shown.

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TABLE 2
TEXAS: CRUSHED STONE SOLD OR USED, BY KIND[1]

Kind	2004 Number of quarries	2004 Quantity (thousand metric tons)	2004 Value (thousands)	2005 Number of quarries	2005 Quantity (thousand metric tons)	2005 Value (thousands)
Limestone [2]	115 r	116,000	$593,000 r	104	129,000	$792,000
Dolomite	1	W	W	1	W	W
Calcareous Marl	2	1,500	6,090	1	21	125
Marble	3	59	992	3	55	1,160
Shell	(3)	W	W	(3)	W	W
Granite	1	W	W	1	W	W
Traprock	1	W	W	1	W	W
Sandstone and quartzite	4	816 r	4,450 r	4	857	7,420
Volcanic cinder	--	--	--	1	W	W
Miscellaneous stone	8 r	2,030 r	9,680 r	8	1,760	9,880
Total	XX	122,000	621,000 r	XX	134,000	823,000

rRevised. W Withheld to avoid disclosing company proprietary data; included in "Total." XX Not applicable. -- Zero.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes limestone-dolomite reported with no distinction between the two.
[3]Sales/distribution yards.

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TABLE 3
TEXAS: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2005, BY USE[1]

(Thousand metric tons and thousand dollars)

Use	Quantity	Value
Construction:		
Coarse aggregate (+1½ inch):		
Riprap and jetty stone	445	3,260
Filter stone	1,400	19,400
Other coarse aggregates	1,830	12,700
Total	3,670	35,300
Coarse aggregate, graded:		
Concrete aggregate, coarse	10,500	73,400
Bituminous aggregate, coarse	2,640	17,300
Bituminous surface-treatment aggregate	927	5,920
Railroad ballast	W	W
Other graded coarse aggregates	3,630	31,200
Total	17,700	128,000
Fine aggregate (-⅜ inch):		
Stone sand, concrete	3,130	17,900
Stone sand, bituminous mix or seal	476	2,890
Screening, undesignated	134	1,010
Other fine aggregates	1,640	9,670
Total	5,380	31,400
Coarse and fine aggregate:		
Graded road base or subbase	13,100	62,100
Terrazzo and exposed aggregate	(2)	(2)
Crusher run or fill or waste	588	2,710
Other coarse and fine aggregates	13,200	75,900
Total	26,900	141,000
Other construction materials	123	365
Agricultural:		
Agricultural limestone	(3)	(3)
Poultry grit and mineral food	(3)	(3)
Other agricultural uses	13	127
Total	1,160	6,640
Chemical and metallurgical:		
Cement manufacture	12,000	43,600
Lime manufacture	(3)	(3)
Sulfur oxide removal	(3)	(3)
Special:		
Asphalt fillers or extenders	(3)	(3)
Other fillers or extenders	(3)	(3)
Other miscellaneous uses and other specified uses not listed	9	104
Unspecified:[4]		
Reported	53,400	349,000
Estimated	11,300	66,400
Total	64,700	415,000
Grand total	134,000	823,000

W Withheld to avoid disclosing company proprietary data; included with "Other graded coarse aggregates."
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Withheld to avoid disclosing company proprietary data; included with "Other coarse and fine aggregates."
[3]Withheld to avoid disclosing company proprietary data; included in "Grand total."
[4]Reported and estimated production without a breakdown by end use.

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TABLE 4

TEXAS: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2005, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3		District 4	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Construction:								
Coarse aggregate (+1½ inch)[2]	W	W	--	--	W	W	W	W
Coarse aggregate, graded[3]	W	W	W	W	W	W	W	W
Fine aggregate (-⅜ inch)[4]	W	W	W	W	W	W	W	W
Coarse and fine aggregates[5]	W	W	W	W	W	W	W	W
Other construction materials	--	--	--	--	27	51	--	--
Agricultural[6]	--	--	W	W	--	--	--	--
Chemical and metallurgical[7]	--	--	--	--	W	W	W	W
Special[8]	--	--	--	--	--	--	--	--
Other miscellaneous uses	--	--	--	--	--	--	--	--
Unspecified:[9]								
Reported	--	--	--	--	523	3,090	--	--
Estimated	183	1,000	--	--	766	4,500	159	919
Total	616	6,050	506	2,250	4,300	22,500	4,000	24,200

	District 5		District 6		District 7		District 8	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Construction:								
Coarse aggregate (+1½ inch)[2]	62	548	W	W	2,590	18,500	W	W
Coarse aggregate, graded[3]	W	W	--	--	12,500	78,400	W	W
Fine aggregate (-⅜ inch)[4]	W	W	--	--	4,140	23,800	W	W
Coarse and fine aggregates[5]	2,940	15,900	W	W	17,700	80,000	W	W
Other construction materials	--	--	--	--	95	315	--	--
Agricultural[6]	W	W	--	--	W	W	--	--
Chemical and metallurgical[7]	W	W	--	--	W	W	--	--
Special[8]	W	W	--	--	W	W	--	--
Other miscellaneous uses	9	104	--	--	--	--	--	--
Unspecified:[9]								
Reported	17,500	108,000	--	--	18,200	114,000	9,010	64,600
Estimated	7,700	46,000	39	230	2,300	13,000	--	--
Total	38,000	231,000	157	1,270	63,600	351,000	11,600	107,000

	District 9		Unspecified districts	
	Quantity	Value	Quantity	Value
Construction:				
Coarse aggregate (+1½ inch)[2]	--	--	--	--
Coarse aggregate, graded[3]	W	W	32	526
Fine aggregate (-⅜ inch)[4]	W	W	--	--
Coarse and fine aggregate[5]	W	W	286	3,090
Other construction materials	--	--	--	--
Agricultural[6]	--	--	--	--
Chemical and metallurgical[7]	--	--	--	--
Special[8]	--	--	--	--
Other miscellaneous uses	--	--	--	--
Unspecified:[9]				
Reported	8,190	58,600	--	--
Estimated	151	890	--	--
Total	10,600	74,800	318	3,610

See footnotes at end of table.

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TABLE 4--Continued
TEXAS: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2005, BY USE AND DISTRICT[1]

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes filter stone, riprap and jetty stone, and other coarse aggregate.
[3]Includes bituminous aggregate (coarse), bituminous surface-treatment aggregate, concrete aggregate (coarse), railroad ballast, and other graded coarse aggregate.
[4]Includes screening (undesignated), stone sand (bituminous mix or seal), stone sand (concrete), and other fine aggregates.
[5]Includes crusher run or fill or waste, graded road base or subbase, terrazzo and exposed aggregate, and other coarse and fine aggregates.
[6]Includes agricultural limestone, poultry grit and mineral food, and other agricultural uses.
[7]Includes cement and lime manufacture, and sulfur oxide removal.
[8]Includes asphalt fillers or extenders and other fillers or extenders.
[9]Reported and estimated production without a breakdown by end use.

TABLE 5
TEXAS: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2005, BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	31,200	$206,000	$6.59
Plaster and gunite sands	776	4,170	5.37
Concrete products (blocks, bricks, pipe, decorative, etc.)	230	2,150	9.36
Asphaltic concrete aggregates and other bituminous mixtures	1,190	7,960	6.70
Road base and coverings	3,720	19,000	6.10
Road and other stabilization (cement)	1,530	9,460	6.18
Fill	5,840	14,400	2.46
Other miscellaneous uses[2]	130	925	7.12
Unspecified:[3]			
Reported	14,800	91,800	6.22
Estimated	21,300	116,000	5.46
Total or average	80,700	472,000	5.84

[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes filtration.
[3]Reported and estimated production without a breakdown by end use.

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TABLE 6
TEXAS: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2005, BY USE AND DISTRICT[1,2]

(Thousand metric tons and thousand dollars)

Use	Districts 1 and 2		Districts 3 and 4		District 5	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregates (including concrete sand)	2,350	16,600	1,690	11,300	7,280	47,200
Concrete products (blocks, bricks, pipe, decorative, etc.)[3]	77	537	94	483	208	2,050
Asphaltic concrete aggregates and other bituminous mixtures	111	1,350	--	--	320	1,900
Road base and coverings[4]	216	1,750	41	175	1,310	8,900
Fill	370	1,270	133	419	1,490	3,780
Other miscellaneous uses[5]	87	478	14	60	27	375
Unspecified:[6]						
Reported	71	405	--	--	2,540	18,500
Estimated	4,500	25,000	1,900	10,300	5,900	31,200
Total	7,820	47,400	3,840	22,800	19,100	114,000
	Districts 6 and 8		Districts 7 and 9		Unspecified districts	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregates (including concrete sand)	10,300	63,000	7,360	51,600	2,280	16,000
Concrete products (blocks, bricks, pipe, decorative, etc.)[3]	387	1,170	239	2,090	--	--
Asphaltic concrete aggregates and other bituminous mixtures	249	1,050	509	3,670	--	--
Road base and coverings[4]	2,740	14,600	949	2,990	--	--
Fill	3,260	6,800	592	2,110	--	--
Other miscellaneous uses[5]	2	12	--	--	--	--
Unspecified:[6]						
Reported	7,060	40,000	4,920	31,900	171	940
Estimated	5,500	25,000	3,600	19,600	--	--
Total	29,400	157,000	18,100	114,000	2,450	16,900

W Withheld to avoid disclosing company proprietary data; included in "Other miscellaneous uses." -- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Districts 1 and 2, 3 and 4, 6 and 8, and 7 and 9 are combined to avoid disclosing company proprietary data.

[3]Includes plaster and gunite sands.

[4]Includes road and other stabilization (cement).

[5]Includes filtration.

[6]Reported and estimated production without a breakdown by end use.

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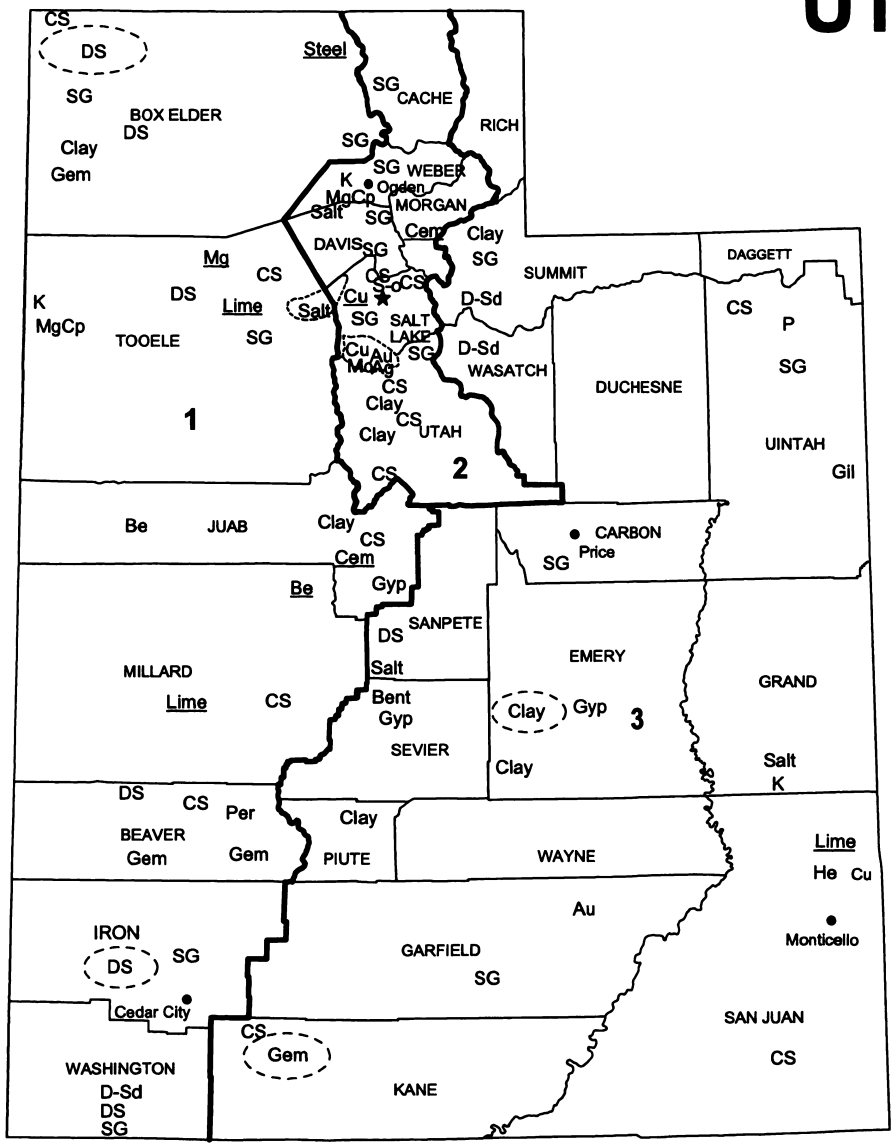

LEGEND

- County boundary
- Capital
- City
- 1 — Crushed stone/sand and gravel districts

MINERAL SYMBOLS
(Major producing areas)

Ag	Silver
Au	Gold
Be	Beryllium
Be	Beryllium plant
Bent	Bentonite
Cem	Cement plant
Clay	Common clay
CS	Crushed stone
Cu	Copper
Cu	Copper plant
D-Sd	Dimension sandstone
DS	Dimension stone
Gem	Gemstones
Gil	Gilsonite
Gyp	Gypsum
He	Helium
K	Potash
Lime	Lime plant
Mg	Magnesium metal plant
MgCp	Magnesium compounds
Mo	Molybdenum
P	Phosphate rock
Per	Perlite
S-o	Sulfur (oil)
Salt	Salt
SG	Construction sand and gravel
Steel	Steel plant

Concentration of mineral operations

Source: Utah Geological Survey/U.S. Geological Survey (2005)

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THE MINERAL INDUSTRY OF UTAH

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Utah Geological Survey, for collecting information on all nonfuel minerals.

In 2005, Utah's nonfuel raw mineral production was valued[1] at $2.79 billion, based upon annual U.S. Geological Survey (USGS) data. This was an $840 million, or 43% increase from the State's total nonfuel mineral value of $1.95 billion in 2004, which was up $590 million from 2003 to 2004, then representing a nearly identical percentage increase of 43.4%. The State rose to 5th from 6th in rank among the 50 States in total nonfuel mineral production value and accounted for more than 5% of the U.S. total value.

Metals accounted for more than 74% of Utah's nonfuel mineral production value, and copper and molybdenum concentrates accounted for about two-thirds of the State's entire metal value. In 2005, the most substantial changes were in the metals sector—the values of molybdenum concentrates, copper, and gold, up more than $600 million, more than $60 million, and nearly $50 million, respectively. Other mineral commodities with substantial increases in value in 2005 were the industrial mineral commodities of salt, up $25 million; construction sand and gravel, up $24 million; portland cement and potash, up more than $15 million each; magnesium compounds, up $14 million; and lime, up about $11 million (table 1). Significant increases also took place in silver and phosphate rock. The values per unit (quantity) of production or sales increased for each of these nonfuel minerals, especially those of copper, molybdenum concentrates, magnesium compounds, potash, salt, and lime (descending order of increase), the unit value of each rising by about 20% or more. The only substantial decrease in value was that of magnesium metal, down about 12%. Smaller decreases in total value also took place in Grade-A helium, crude perlite, and dimension sandstone (table 1).

The single highest increase in value, that of molybdenum concentrates, has resulted from the dramatic increases in the commodity's prices, especially during 2004-05, the upward trend having previously begun in December 2002 and continuing on throughout 2003 into 2004. As reported in Platts Metals Week (in dollars per pound of contained molybdenum), the annual average price of molybdic oxide rose from $8.27 per kilogram (kg) in 2002 to $11.75 per kg in 2003, to $36.73 per kg in 2004, and nearly doubled to $70.10 per kg (about $32 per pound) in 2005. In June 2005, the monthly average molybdic oxide price reached its highest point of the 4-year run at $82.54, and then followed a generally downward trend the rest of the year to close at $61.84. Molybdenum concentrate prices had stayed relatively level during the early months of 2006.

[1]The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity. All 2005 USGS mineral production data published in this chapter are those available as of December 2006. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—can be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

In 2005, Utah continued to be the only State to produce magnesium metal and beryllium concentrates (descending order of value). The State remained second in rank in the quantities of copper and potash produced, as well as fourth in phosphate rock, silver, and perlite, fifth in bentonite, and sixth in salt. The State rose to first from third in the production of molybdenum concentrates, to second from third of 11 gold-producing States, and to second from third in magnesium compounds. Additionally, Utah was a producer of substantial quantities of portland cement, construction sand and gravel, lime, common clays, and gemstones (commodities listed in descending order of value).

The Utah Geological Survey[2] (UGS) provided the following narrative information. UGS production data were based upon its surveys, estimates, and information gathered from company annual reports. These data may differ from some USGS annual production figures, which were based upon USGS company surveys and estimates.

Exploration and Development Activities

In 2005, mineral exploration increased significantly for copper, iron, molybdenum, gold, zinc, and uranium, mainly as a result of steadily increasing metal prices. Several mine development projects were carried out to improve and expand the mining of copper, copper-molybdenum, iron, and uranium ores. Specifically, ore reserves at the Bingham Canyon Mine (molybdenum-copper-gold-silver) were increased, mining at the Lisbon Valley Mine (copper) was initiated, advanced stages of exploration and development were conducted in the Iron Springs (iron) and Rocky Range-Beaver Lake (copper-gold) mining districts, and exploration in the historic mining areas of the Colorado Plateau (uranium) was resumed. Also, the number of new mining claims filed in the State rose dramatically from a low of 508 in 2001 to more than 7,500 in 2005. San Juan County recorded the most new mining claims with more than 3,400.

Bingham District

Kennecott Utah Copper Corporation (KUC) approved the $170 million East 1 overburden removal project at Bingham Canyon that would extend the open pit mine life to 2017, and will fund an expansion of the molybdenum-recovery plant. The East 1 project would add about 147.8 million metric tons (Mt) of ore, averaging 0.83% copper, 0.10% molybdenum, 0.27 parts per million (ppm) gold, and 2.7 ppm silver to the existing porphyry reserve. KUC also drilled nine deep exploration holes in 2005, totaling 9,898 meters (m). KUC continued to evaluate various plans to exploit the deep porphyry roots beneath the pit.

[2]Kenneth Krahulec, Geologist, and Roger Bon, Industry Outreach Specialist, of the Utah Geological Survey authored the text of the State mineral industry information provided by that State agency.

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Options being studied included expanding overburden removal of the open pit on the west side (Highland Boy); developing the North Skarn underground mine, a resource of 12.2 Mt averaging 1.9% copper, 1.23 ppm gold, and 13.4 ppm silver; or constructing a large block-cave type underground mine to recover mineral values from the northeast and southeast porphyry roots.

As part of an ongoing porphyry copper exploration program, Kennecott Exploration Company investigated the Oquirrh Mountains about 23 kilometers (km) southwest of Bingham. Using aeromagnetic prospecting techniques, results indicated little or no copper mineral value imbedded in the massive monzonite and latite porphyry. As a result, all exploration on the property was discontinued (W.L. Gunter, Consultant, written commun., 2006).

Fish Springs District

Lithic Resources Ltd. acquired Eurozinc Mining Corporation's 100% interest in the Crypto zinc skarn in the Fish Springs mining district of western Juab County. In 1993, Cyprus Amax Minerals Company estimated a mineral resource of about 5.4 Mt of sulfide mineralization grading 8.7% zinc and approximately 2.8 Mt of oxide mineralization grading 7% zinc.

Gold Hill District

Dumont Nickel Inc. intersected more than 3 m of 1 ppm gold in 4 of the 24 holes drilled on its Cane Springs property in Tooele County. The best hole (RC-20) included a 6-m cut from 4.6 m to 10.7 m, averaging 9.6 ppm gold near the historic Cane Springs skarn gold mine. Dumont also intersected 54.9 m of 1.1 ppm gold in the nearby Kiewit zone (KZ-01), starting at the surface in an intense quartz vein stockwork hosted by granodiorite. Further exploration drilling was planned for 2006.

Iron Springs District

Palladon Ventures Ltd. acquired the idle Comstock/Mountain Lion open pit mine (about 16 Mt averaging 52% iron) and the Rex iron ore deposit in Iron County from the former Geneva Steel for $10 million. Iron Springs has been one of the most productive iron mining district in the western United States, having yielded an estimated 91 Mt of ore from 1845 through 1995. Iron was recovered from several skarn/replacement-type ore bodies, averaging slightly more than 50% iron during this period. As part of the acquisition, Palladon purchased its partner's (Western Utah Copper Company) interest in the properties, posted a reclamation bond to complete the closing of the purchase, and selected a local mining contractor to begin redevelopment activities. Palladon further agreed to project financing terms with a new 50% partner, Luxor Capital Partners, LLP, for an open pit mine and mill with expected capital costs of about $16 million (Don Foot, Palladon Ventures, verbal commun., January 19, 2006).

Lisbon Valley District

Constellation Copper Corporation began mining, crushing, stacking, and acid treating at its Lisbon Valley solvent extraction-electrowinning (SX-EW) copper mine in southeastern Utah. The Lisbon Valley operation focused on the use of sandstone-hosted copper oxide as feed material. Reserves at yearend 2005 were estimated to be 35.5 Mt, averaging 0.49% copper in three previously mined open pits (Constellation Copper Corporation, 2006§[3]). The project was expected to produce about 24,500 metric tons per year of cathode copper during the life of the mine. Construction of the Lisbon Valley SX-EW facility was delayed somewhat as a result of supply and labor shortages associated with the rebuilding efforts on the Gulf Coast following Hurricanes Katrina and Rita in August and September. Mining was begun initially at a rate of 21,800 metric tons per day (t/d) in preparation for copper cathode production at the SX-EW facility in early 2006. Exploration was continued at the new Flying Diamond copper discovery, several kilometers to the southeast of the current mining operation. Initial drilling at Flying Diamond intersected an average 25.3 m of 0.71% copper in 13 holes.

Milford Area

Palladon Ventures and Western Utah Copper (joint–venture partners in the Western Utah Copper Project) released a resource estimate on their Nevada Star copper property near Milford. Exploration results in the Rocky Range and Beaver Lake mining districts showed a combined indicated resource from four separate skarn and porphyry deposits of 2.2 Mt, averaging about 1.38% copper at a 0.6% copper cutoff level. Results from an exploration drill hole (BCC-1) near the Beaver Carbonate lead-silver mine in the San Francisco district revealed a 5-m-thick deposit containing 3.7% copper and 843 ppm silver at a depth of 218 m. The joint venture has applied for a large mine permit with the State of Utah (Mark Dotson, Western Utah Copper, verbal commun., February 8, 2006).

Nevada Pacific Gold Company acquired the Bat Ridge gold-copper-skarn prospect in the Beaver Lake mining district. Nevada Pacific then completed a program of geologic mapping, rock-chip geochemical sampling, and an aeromagnetic survey of the prospect. Additional work leading to a drill program was anticipated in 2006.

Ohio-Mount Baldy District

In 2005, Unico, Inc. drilled 13 holes totaling more than 2,135 m at the Deer Trail Mine in Piute County. The main objective was to identify and evaluate the mineralization contained in extensions of known base-metal mantos in the Pennsylvanian Callville Limestone, ores from which historically have averaged 6.5 ppm gold, 538 ppm silver, 2.84% lead, 6.26% zinc, and 0.76% copper. Unico was granted a large mine permit by the State (Bon and Wakefield, 2006).

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[3]References that include a section mark (§) are found in the Internet References Cited section.

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Tintic District

Atlas Mining Company (Osburn, Idaho) purchased the Dragon halloysite mine in Juab County for $500,000. Halloysite is a high-value, bright white, microtubular clay with unique applications based on its unusual structure. The deposit is a selective hydrothermal replacement of the Cambrian Ajax Limestone adjacent to a monzonite plug. Atlas began developing the 272,000-t deposit as an underground mine, constructing both an adit and a 15° decline to access the halloysite beds. The majority of the higher grade material is below the 91-m level. The decline reached the 76-m level in 2005.

Uranium

No uranium ore was mined in Utah in 2005, although uranium prices have increased significantly since December 2002, rising from $22.44/kg at the end of 2002 to $80.30/kg at the end of 2005 (TradeTech, 2006§). Eleven of 12 permitted uranium/vanadium mines were listed as inactive in 2004. One new small mine permit application was received in 2005, and seven notices of intent were received for uranium exploration.

A uranium staking rush in the Four Corners region since the beginning of 2005 has resulted in the location of more than 5,000 new unpatented claims in Emery, Garfield, Grand, and San Juan Counties. Most of these new claims cover either known sandstone-hosted uranium resources or exploration plays in the major historical uranium districts. The Tony M and Frank M uranium reserves in the Shootaring Canyon District (Garfield County) are controlled by International Uranium Corporation and Energy Metals Corporation, respectively. Energy Metals has also acquired the nearby Congress uranium property.

The Lisbon Valley mining district, Utah's largest producer with 35.4 million kg of triuranium octaoxide (U_3O_8) recovered from approximately 11.6 Mt of ore, has been particularly heavily targeted by Universal Uranium Ltd. and Mesa Uranium Corp. Energy Metals Corp. is also active in the district. Both the Shootaring Canyon and Lisbon Valley mining districts are located near existing, permitted uranium mills that include the Shootaring Canyon mill at Ticaboo (U.S. Energy Corp., on standby) and theWhite Mesa mill at Blanding (International Uranium Corporation, active).

MAX Resource Corp. acquired 195 lode claims on a potential in-situ leach uranium play in the Spor Mountain District of west-central Utah. The mineralization is hosted in late Tertiary caldera-fill volcaniclastic rocks, similar to the nearby Yellow Chief uranium deposit. MAX Resource Corp. also received a permit for a six-hole, 366-m drill program.

Commodity Review

Industrial Minerals

Industrial-minerals production, with an estimated value of $759 million (an alltime high) was the second-leading contributor to the value of minerals produced in 2005. The value of industrial minerals has grown substantially during the past 10 years, increasing by 75% from the $434 million recorded in 1996. Commodities or commodity groups that have realized the majority of these gains include sand and gravel and crushed stone; portland cement; salines, including salt, magnesium chloride, potash (potassium chloride), and sulfate of potash (SOP); lime; and phosphate rock. These commodities accounted for 89% of the total value of the industrial minerals production. Other important commodities produced in Utah, in descending order of value, included gilsonite, expanded shale, common clay, bentonite and kaolinite, and gypsum.

Cement.—Holcim (US) Inc. and Ash Grove Cement Company produced portland cement in the State during 2005. Holcim's Devil's Slide Mine and plant are east of Morgan in Morgan County, and Ash Grove's Leamington Mine and plant are east of Lynndyl in Juab County. Both plants operated at or above design capacity during the year, with total production of about 1.5 Mt. In addition to limestone, both Holcim and Ash Grove Cement mine modest amounts of shale and sandstone that are used in the manufacture of cement.

Common Clay and Bentonite.—Based upon UGS surveys, nearly 300,000 t of common clay and approximately 62,000 t of bentonite were produced by eight companies in 2005, a 7% increase in common clay and a 38% decrease in bentonite compared with production in 2004. Statewide, there were 21 active mine permits held by clay operators in 2005. Many of these mines were operated intermittently. The two largest producers of common clay in 2005 were Interstate Brick and Interpace Industries. Two companies (Western Clay Company and Redmond Minerals, Inc.) produced bentonite from pits located in central Utah. More than 75% of all common clay was used in the manufacture of brick. Bentonite is used as a sealant in many civil engineering applications, as a pet-waste absorbent (litter-box filler), as an additive in oil-and-gas-drilling fluids, and as a binder in foundry molds. ECDC Environmental, LLC intermittently produces clay for use at their waste disposal facility near the town of East Carbon in Carbon County.

Construction Sand and Gravel and Crushed Stone.—Sand and gravel and crushed stone (including limestone) were the third-leading contributors to the value of industrial minerals produced in Utah during 2005 (down from the leading contributors in 2004), with an estimated value of $186 million, about $16 million (9%) higher than in 2004. These materials were produced in nearly every county in Utah by commercial operators, and by Federal, State, and county agencies. Because of the large number of operations (approximately 140 active pits and quarries), the UGS did not send production questionnaires to this group. However, production data for 2005, as compiled by the USGS, showed production of 33.9 Mt of sand and gravel, with a value of $149 million, and 8.4 Mt of crushed stone, with a value of $46.6 million. Sand and gravel production increased by 13% and crushed stone production increased by 4.0% in 2005 compared with that of 2004. Crushed stone production includes raw material for both lime and cement plants.

Expanded Shale and Perlite.—Two companies, Utelite, Inc. and Basin Perlite Company, produced lightweight "expanded" products from shale and perlite for use primarily in the construction and building industries. Mine production was about 248,000 t in 2005, a slight increase from 2004. Utelite's mine is south of the town of Wanship in Summit County. The Basin Perlite mine, located northeast of the town of Milford in Beaver County, was shut down in March 2005 and is inactive.

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Gilsonite.—Gilsonite production for 2005 was estimated to be about 73,000 t, about 9,100 t more than in 2004. Gilsonite is an unusual solid hydrocarbon that has been mined in Utah for more than 100 years. All of the gilsonite mines are located in southeastern Uintah County. The three companies that produced gilsonite were, in descending order of production, American Gilsonite Co., Ziegler Chemical & Minerals Co., and Lexco, Inc. Gilsonite is marketed worldwide for use in more than150 products ranging from printing inks to explosives. Gilsonite production has been increasing modestly during the past several years.

Gypsum.—Four companies produced about 390,000 t of gypsum in 2005, about 9,100 t more than in 2004. In descending order of production, the three largest producers were U.S. Gypsum Co., H.E. Davis and Sons, and Nephi Gypsum, Inc. U.S. Gypsum operates the only active wallboard plant in Utah. The plant is located near the town of Sigurd in Sevier County. The Georgia-Pacific plant, also near Sigurd, closed in 2002, and the company's mines in Utah were inactive. Statewide, there were only five active gypsum mines.

Most gypsum produced in Utah is used for wallboard production, but several operators supply crude gypsum to regional cement companies where it is used as an additive to retard the setting time of cement. Gypsum is also used by the agricultural industry as a soil conditioner.

Lime.—Lime production increased by about 10% in 2005 more than that of 2004, with an estimated production of about 726,000 t. There were two suppliers of lime in Utah, with a combined capacity of more than 0.9 million metric tons per year. Graymont Western U.S., Inc. produced dolomitic quick lime and high-calcium quick lime, and Chemical Lime Co. produced dolomitic quick lime and hydrated dolomitic lime. Both operations serve markets in Utah and surrounding States. Graymont Western's plant is in the Cricket Mountains, approximately 56 km southwest of Delta in Millard County, and is one of the 10 largest lime plants in the United States. Chemical Lime's plant is about 13 km northwest of Grantsville in Tooele County.

In 2005, an additional 13 to 15 operators quarried about 2.0 Mt of limestone and dolomite, which was used mainly for crushed stone as well as flue-gas desulfurization in coal-fired powerplants. A small amount of limestone and dolomite was also crushed to a fine powder and marketed as "rock dust" to the coal mining industry.

Phosphate Rock.—Simplot Phosphates LLC (formerly SF Phosphates, Ltd.) is Utah's only phosphate rock producer. The company's phosphate operation is 18 km north of Vernal in Uintah County. The mine produces roughly 2.7 to 3.6 Mt of ore annually, which is processed into 0.9 to 1.8 Mt of phosphate concentrate. The concentrate is transported in slurry form to the company's Rock Springs, WY, fertilizer plant via a 144-km-long underground pipeline. During 2005, the mine produced about 3.4 Mt of ore, about the same as in 2004.

Salt, Magnesium Chloride, and Potash.—Brine-derived products, including salt, were the most significant contributors (up from third-leading in 2004) to the value of industrial mineral production in Utah during 2005, with a combined value of $262 million, about $83 million (46%) more than in 2004. Most of the increase in value was owing to a substantial increase in the production of potash. In addition to salt, brine-derived products include magnesium chloride and potash [potassium chloride and sulfate of potash (SOP)]. North Shore Limited Partnership produced a small amount of concentrated brine that was used as an ingredient in mineral food supplements. The statewide production of salt and other brine-derived products, excluding magnesium metal, was estimated to be 4.38 Mt in 2005, about 0.94 Mt more than in 2004. Potash production, including SOP, was estimated to be about 1.16 Mt in 2005, approximately 0.71 Mt more than in 2004.

Salt production alone was estimated to be 2.63 Mt in 2005, about 63,500 t more than in 2004, with most of the production coming from three operators processing brine from Great Salt Lake. The three leading companies were, in descending order of production, Great Salt Lake Minerals Corporation, Cargill Salt Company, and Morton International. In addition, three other companies produce salt and/or potash from operations not located on Great Salt Lake. These included Intrepid Mining, LLC at Wendover in Tooele County (solar salt and potash), Moab Salt, LLC near Moab in Grand County (solar salt and potash), and Redmond Minerals, Inc. near Redmond in Sanpete County (rock salt).

Metals

Base-metal production, with an estimated value of $2.09 billion, was the leading contributor to the value of minerals produced in Utah during 2005, an alltime high. In descending order of value, the base metals included molybdenum, copper, magnesium, and beryllium. The 2005 base-metal values were about $957 million (84%) more than 2004. This increase followed a 65% increase in the value of base-metal production in 2004. Precious-metal production, valued at $209 million, included gold (87% of total value) and silver (13% of total value). Precious-metal values in 2005 were $51 million (32%) higher than in 2004.

KUC's Bingham Canyon Mine, located about 32 km southwest of Salt Lake City in Salt Lake County, was the State's major producer of copper, gold, and silver, and its sole producer of molybdenum. For the first time in its more than 100-year history, molybdenum surpassed copper as the most valuable product. The combined value of minerals produced from the Bingham Canyon Mine in 2005 was about 63% of the total value of all minerals produced statewide.

Beryllium.—Utah continued to be the Nation's sole producer of beryllium concentrates. Beryllium ore (bertrandite) is mined at Brush Resources' Topaz and Hogs Back Mines in Juab County and processed along with imported beryl at the company's plant a few miles north of Delta in Millard County. The product (beryllium hydroxide) is then sent to the company-owned refinery and finishing plant in Ohio, where it is converted into beryllium metal, alloys, and oxide. No bertrandite ore was mined in 2005, but about 38,000 t of stockpiled and purchased ore was milled at the Delta plant.

Brush Wellman (the parent company of Brush Resources) announced that it was awarded a $9 million contract under the Department of Defense's Defense Production Act, Title III

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Program. The contract is intended to support the engineering and design of a new facility for the processing of beryllium hydroxide, the feedstock material used to produce beryllium metal products. The awarding of the contract represents a key step toward the return of a sustainable domestic supply of beryllium, a material critical to the Nation's strategic interests (Shedd, 2006). The new facility, to be owned and operated by Brush Wellman, will be located at an existing plant site in Elmore, Ohio. The total cost of the facility is expected to range from $40 to $60 million. Approximately 25 additional jobs are expected to be created to operate and maintain the facility (Brush Wellman, 2006§).

Copper.—Copper was the second-leading contributor to the value of nonfuel minerals in Utah. Substantial price increases in 2003, 2004, and 2005 raised the unit value of copper to an alltime high, and the value of base-metal production statewide to more than $2 billion for the first time. From 2002 through 2005, the average annual price of copper increased from $1.67 per kilogram ($0.758 per pound) to $3.72 per kilogram ($1.69 per pound). Refined copper production from Kennecott's Bingham Canyon Mine decreased slightly in 2005 to approximately 232,000 t from approximately 247,000 t in 2004 (Rio Tinto, 2006).

The Lisbon Valley copper mine, located 72 km southeast of Moab in San Juan County, began operating in December 2005, and was scheduled to produce about 18,000 t of copper in 2006 (Greg Hahn, Constellation Copper Corporation, written commun., March 2006).

Gold and Silver.—Refined gold production in 2005 was estimated to be about 12,500 kilograms (kg) (401,000 troy ounces) (oz), a 30% increase from the 9,600 kg (308,000 oz) produced in 2004. Gold was produced from two surface mines owned by Kennecott Corporation: one primary producer (Barneys Canyon Mine) and one byproduct operation (Bingham Canyon Mine), both located in Salt Lake County. Several other small mines in the State may produce minor amounts of gold and silver, but metal-specific production is not reported and not included in the above totals. The Barneys Canyon Mine exhausted its economic ore reserves in late 2001 and ceased mining, but was to continue to produce gold from its heap-leach pads at a much reduced rate into 2007, when those pads were expected to be depleted. Silver byproduct recovered from the Bingham Canyon Mine netted 0.11 million kg (3.54 million oz) of refined silver in 2005, about 6% higher than in 2004.

Magnesium.—Magnesium metal was the third-leading contributor to the value of base metals in 2005. Magnesium metal was produced from Great Salt Lake brines by US Magnesium LLC at its Rowley electrolytic plant in Tooele County. The plant's annual capacity was 43,000 t of magnesium metal (99.8% purity). It is the only active primary magnesium processing facility in the United States. Magnesium production in 2005 was slightly lower than in 2004. The planned expansion of the plant to 50,000 t was anticipated by yearend 2005. Magnesium metal prices declined from $3.48/kg in 2004 to $2.71/kg in 2005 (Kramer, 2006).

Molybdenum.—In 2005, for the first time, molybdenum was the largest contributor to the value of Utah's base-metal production. Kennecott's Bingham Canyon Mine produced about 15,600 t of coproduct molybdenum in 2005, 130% more than in 2004 (Rio Tinto, 2006). The increased production of molybdenum, supported by the substantial increase in the price of molybdenum, supplanted copper as the most valuable mineral product from the century-old porphyry copper-molybdenum-gold-silver operation. The Bingham Canyon Mine was one of only eight molybdenum-producing mines in the United States in 2005. The USGS reported that domestic mine output of molybdenum increased 37% in 2005, following a 24% increase in 2004 (Magyar, 2006). According to an industry report, the substantial increase in molybdenum production in 2005 was in response to increased worldwide demand (Rio Tinto, 2006).

Government Programs and Activities

Federal Government

Environmental Issues.—The U.S. Department of Energy and the State of Utah agreed in 2005 to move the 10.7 Mt of uranium mill tailings located along the Colorado River near Moab. The tailings were planned to be moved 48 km north to a site near Crescent Junction, Utah. The best method for the move was to be studied in 2006 and the move was anticipated to begin in 2007. Costs for moving the tailings were estimated at more than $400 million.

The U.S. Environmental Protection Agency (EPA) began or continued steps toward environmental restoration of the areas at three historic Utah mining sites. The most significant of these efforts was the Eureka Mills project in the Tintic mining district. The EPA and Chief Consolidated Mining Company have agreed upon Chief's liability for the cleaning up of this site. The EPA also focused on the Jacobs Smelter and related sites in the Stockton district, and historic mine and mill sites in the Ophir district. In addition, the Utah Division of Oil, Gas and Mining continued work within its abandoned mine reclamation program in the Ophir District, Gold Hill District, Browns Hole District, San Rafael Swell, as well as the Uinta Basin gilsonite mines.

State Government

Utah Geological Survey Publications.—The UGS published a "Uranium and vanadium in Utah" digital map (Gloyn and others, 2005) that shows Utah's uranium-vanadium occurrences, mines, mining districts, mills, and the distribution of the primary host strata. The UGS also completed studies on the "High-calcium limestone resources of Utah" (Tripp, 2005), the coal resources of the southern Wasatch Plateau (Quick and others, 2005), and "Large mines in Utah, 2005" (Bon and Wakefield, 2006).

The new "Uinta Mountains Geology" guidebook published by the Utah Geological Association (Dehler and others, 2005) contains two interesting papers on ore deposits. One paper discusses the many metal occurrences in the Uinta Mountains (Conn, 2005) and a second paper covers the recently discovered Columbian-type, hydrothermal emerald and fibrous calcite mineralization along the South Flank fault zone (Nelson and others, 2005). A detailed summary of Utah's coal industry and other energy and mineral data can be found on the UGS Web site http://geology.utah.gov.

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TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN UTAH[1,2]

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral		2003		2004		2005	
		Quantity	Value	Quantity	Value	Quantity	Value
Beryllium concentrates	metric tons	2,100	NA	2,210	NA	2,780	NA
Clays:							
Bentonite		W	W	73	W	64	W
Common		300	3,270	443	5,600	478	6,710
Gemstones		NA	233	NA	235	NA	235
Salt		2,200	119,000	2,250	107,000	2,250	132,000
Sand and gravel, construction		27,400	113,000	29,800	125,000	33,900	149,000
Stone, crushed		7,820	40,100	8,030 r	45,100 r	8,350	46,600
Combined values of cement (portland), copper, gold, gypsum (crude), helium (Grade-A), lime, magnesium compounds, magnesium metal, molybdenum concentrates, perlite (crude), phosphate rock, potash, silver, stone (dimension sandstone), and values indicated by symbol W		XX	1,080,000	XX	1,660,000	XX	2,460,000
Total		XX	1,360,000	XX	1,950,000 r	XX	2,790,000

rRevised. NA Not available. W Withheld to avoid disclosing company proprietary data. Withheld values included in "Combined values" data. XX Not applicable.
[1]Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2]Data are rounded to no more than three significant digits; may not add to totals shown.

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TABLE 2
UTAH: CRUSHED STONE SOLD OR USED, BY KIND[1]

Kind	2004 Number of quarries	2004 Quantity (thousand metric tons)	2004 Value (thousands)	2005 Number of quarries	2005 Quantity (thousand metric tons)	2005 Value (thousands)
Limestone	12	3,820 r	$25,800 r	11	3,550	$19,400
Dolomite	3	W	W	3	2,890	15,800
Sandstone and quartzite	6	747	4,990	6	1,350	7,730
Volcanic cinder and scoria	2	W	W	2	28	189
Miscellaneous stone	6	579 r	3,680 r	5	536	3,370
Total	XX	8,030 r	45,100 r	XX	8,350	46,600

rRevised. W Withheld to avoid disclosing company proprietary data; included in "Total." XX Not applicable.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.

TABLE 3
UTAH: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2005, BY USE[1]

(Thousand metric tons and thousand dollars)

Use	Quantity	Value
Construction:		
Coarse and fine aggregates:		
Graded road base or subbase	W	W
Unpaved road surfacing	W	W
Terrazzo and exposed aggregate	W	W
Other construction materials	144	824
Agricultural:		
Agricultural limestone	(2)	(2)
Other agricultural uses	(2)	(2)
Total	57	1,010
Chemical and metallurgical:		
Cement manufacture	(2)	(2)
Lime manufacture	(2)	(2)
Flux stone	(2)	(2)
Sulfur oxide removal	(2)	(2)
Total	3,100	16,400
Special, other fillers or extenders	W	W
Unspecified:[3]		
Reported	4,180	23,500
Estimated	842	4,700
Total	5,020	28,100
Grand total	8,350	46,600

W Withheld to avoid disclosing company proprietary data; included in "Grand total."
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Withheld to avoid disclosing company proprietary data; included in "Total."
[3]Reported and estimated production without a breakdown by end use.

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TABLE 4
UTAH: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2005, BY USE AND DISTRICT[1,2]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3		Unspecified districts	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Construction:								
Coarse and fine aggregate[3]	W	W	--	--	--	--	--	--
Other construction materials	15	228	129	596	--	--	--	--
Agricultural[4]	W	W	W	W	--	--	--	--
Chemical and metallurgical[5]	W	W	W	W	--	--	--	--
Special[6]	W	W	--	--	--	--	--	--
Unspecified:[7]								
Reported	1,140	6,300	2,580	14,300	37	205	426	2,720
Estimated	419	2,300	329	1,800	94	523	--	--
Total	3,590	21,100	4,200	22,000	131	728	426	2,720

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]No crushed stone was produced in District 4.
[3]Includes graded road base or subbase, unpaved road surfacing, and terrazzo and exposed aggregate.
[4]Includes agricultural limestone and other agricultural uses.
[5]Includes cement and lime manufacture, flux stone, and sulfur oxide removal.
[6]Includes other fillers or extenders.
[7]Reported and estimated production without a breakdown by end use.

TABLE 5
UTAH: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2005,
BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	1,840	$11,300	$6.13
Concrete products (blocks, bricks, pipe, decorative, etc.)[2]	16	138	8.63
Asphaltic concrete aggregates and other bituminous mixtures	702	4,450	6.34
Road base and coverings[3]	6,140	28,800	4.70
Fill	2,900	8,260	2.85
Snow and ice control	22	78	3.55
Railroad ballast	6	43	7.17
Other miscellaneous uses[4]	133	460	3.46
Unspecified:[5]			
Reported	8,860	37,600	4.24
Estimated	13,200	58,400	4.41
Total or average	33,900	149,000	4.42

[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes plaster and gunite sands.
[3]Includes road and other stabilization (cement).
[4]Includes roofing granules.
[5]Reported and estimated production without a breakdown by end use.

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TABLE 6
UTAH: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2005, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregates and concrete products[2]	909	5,580	566	2,720	381	3,110
Asphaltic concrete aggregates and other bituminous mixtures	171	1,430	52	332	329	2,030
Road base and coverings[3]	1,860	10,100	1,490	6,710	1,680	8,340
Fill	720	2,220	1,860	5,130	190	477
Other miscellaneous uses[4]	38	160	106	341	16	79
Unspecified:[5]						
Reported	2,620	11,400	4,730	21,200	1,170	4,320
Estimated	1,900	8,200	10,100	44,700	1,200	5,400
Total	8,190	39,200	18,900	81,100	5,000	23,800

	Unspecified districts	
	Quantity	Value
Concrete aggregates and concrete products[2]	--	--
Asphaltic concrete aggregates and other bituminous mixtures	150	655
Road base and coverings[3]	1,110	3,650
Fill	123	428
Other miscellaneous uses[4]	--	--
Unspecified:[5]		
Reported	342	660
Estimated	--	--
Total	1,720	5,390

W Withheld to avoid disclosing company proprietary data; included in "Other miscellaneous uses." -- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes plaster and gunite sands.

[3]Includes road and other stabilization (cement).

[4]Includes railroad ballast, roofing granules, and snow and ice control.

[5]Reported and estimated production without a breakdown by end use.

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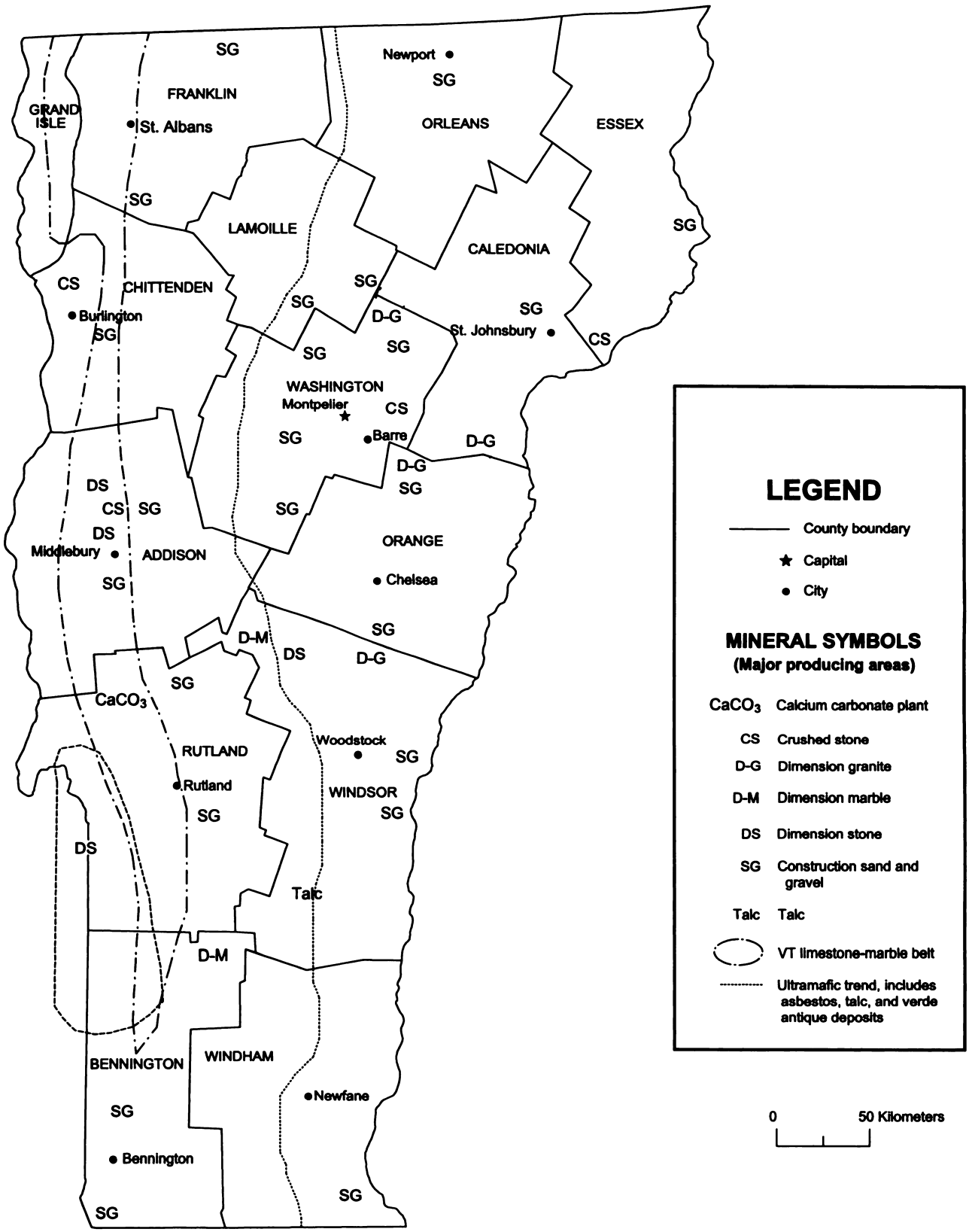
VERMONT



Source: Vermont Geological Survey/U.S. Geological Survey (2005)

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THE MINERAL INDUSTRY OF VERMONT

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Vermont Geological Survey for collecting information on all nonfuel minerals.

In 2005, Vermont's nonfuel raw mineral production was valued[1] at $96.8 million, based upon annual U.S. Geological Survey (USGS) data. This was a nearly 13.3% increase from the State's total nonfuel mineral value for 2004 of $85.4 million, which was up nearly 19% from that of 2002. Vermont was 46th in rank (45th in 2004) among the 50 States in total nonfuel mineral production value, yet, per capita, the State ranked 22d in the Nation in its minerals industry's value of nonfuel mineral production; with a population of about 623,000, the value of production was about $155 per capita. [Because data for crushed slate (2005) and talc have been withheld (company proprietary data), the actual total values for 2003-05 are higher than those reported in table 1.]

In 2005, crushed stone, construction sand and gravel, and dimension stone were Vermont's leading nonfuel mineral commodities, accounting for 38%, 33%, and nearly 29%, respectively, of the State's publishable nonfuel mineral production value. Small to moderate increases in the production of the top two commodities resulted in relatively large increases in their values in 2005 from those of 2004. A 7% increase in crushed stone production led to a $6.2 million, or 20% increase from that of the previous year. Similarly, construction sand and gravel value also showed a significant increase; with its production rising more than 5%, the commodity's value increased by $8 million, up nearly 33% (table 1).

In 2005, Vermont continued to be ranked third in the quantity of talc produced among six producing States and fourth among States that produced dimension stone.

The Vermont Geological Survey[2] (VGS) provided the following narrative information.

Exploration and Development

Mine Permitting

In 2005, Vermont issued six construction sand and gravel extraction permits and amendments to existing permits through the Act 250 process; Act 250 is Vermont's Land Use and Development Law. Extraction rates for the projects ranged from about 3,820 to about 38,200 cubic meters (5,000 to 50,000 cubic yards) per year.

Another five mine permit applications for sand and gravel extraction were submitted for Act 250 review in 2005, the processing of which was to continue on into 2006. One dimension stone application was received to operate an open face rock quarry in Cavendish in southern Windsor County. A decision on the project, which had an estimated rate of extraction of nearly 7,650 cubic meters (10,000 cubic yards) per year, was still pending at yearend. Also, a decision was not finalized regarding an application submitted by Windsor Minerals, Inc. and Luzenac America, Inc. The companies applied to extend the permit expiration date of the Hammondsville Talc Mine from November 15, 2005, to November 15, 2012, to facilitate the ongoing monitoring of the site in terms of safety, drainage and erosion control, as well as its aesthetics.

Four permit applications were denied, one of which was to operate a stone quarry and aggregate processing facility involving approximately 24 hectares (60 acres) of an approximately 36-hectare tract in the Town of Williamstown, south of Montpelier and Barre in central Vermont.

Commodity Review

Industrial Minerals

Calcium Carbonate.—OMYA, Inc., North America, continued to produce calcium carbonate at its plant in Florence, VT. The plant produced ultrafine calcium carbonate, also used in the manufacture of food and pharmaceuticals, mainly as dry and slurry products for the paper, paint, and plastics industries. The plant, purchased by OMYA in 1976, was the company's first North American plant; since that time, the plant has been expanded several times to become one of the most modern of the company's plants. During Earth Science Week 2005, OMYA hosted its 5th annual Open House at the company's white marble quarry in Middlebury. Visitors were able to view and experience firsthand the rocks, quarry equipment, and products.

Government Programs and Activities

The VGS conducts surveys and research of the geology, mineral resources, and topography of the State. In 2005, the VGS emphazed its work toward completing of the bedrock map of Vermont, surficial mapping of the State by quadrangle and watershed, and a natural hazard map program. Mapping projects continued to address societal issues in Vermont: landslide hazard, riverine erosion, and nitrate and naturally occurring radionuclides in bedrock and ground water. Prototype aquifer and aquifer recharge area mapping was underway for town planning. Digital surficial and bedrock data were also used to

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[1]The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2005 USGS mineral production data published in this chapter are those available as of December 2006. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—can be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

[2]Marjorie Gale, Environmental Scientist V, a Geologist with the Vermont Geological Survey, authored the text of the State mineral industry information provided by that agency. The Vermont Geological Survey is designated in Vermont State government as the Division of Geology and Mineral Resources within the Vermont Department of Environmental Conservation.

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further customize HAZUS, an earthquake hazard computer program, to realistically apply the program to the State, simulating local Vermont conditions.

The State Geologist manages interdisciplinary studies with strong geologic components, especially those focused on surface waters, ground water resources, and geologic hazards. Review of projects as they relate to Criterias 9D and 9E of Act 250 is a VGS activity that recognizes the importance of lands with high potential for extraction of mineral and earth resources. The VGS also reviews and makes recommendations regarding mine and quarry reclamation plans in response to current environmental concerns. Published reports are prepared and made available to the public, consultants, industry, and government, providing geologic aid and advice to the public as required by State statute.

The VGS also provides advice concerning the development and working of rock and mineral deposits suitable for building, road making, and economic purposes. The VGS maintains an archive of old and new information as per State statute. In the event of any significant discovery of hydrocarbons in the State, the VGS provides geologic services for Vermont's Natural Gas and Oil Resources Board. Additional information about the VGS and access to its Earth Resources pages are available on the Internet at URL http://www.anr.state.vt.us/dec/geo/vgs.htm. The Earth Resources page shows and provides links to maps of the State's active and inactive sand and gravel, crushed stone, dimension stone, and metallic resource occurrences, prospects, and producers and of the State's geology.

For the ninth year, the VGS was an active leader in Earth Science Week in Vermont. In 2005, the agency welcomed participation from the entire Department of Environmental Conservation, which sponsored Science on the Green, a handson exploration of science for elementary through high school students. More then 400 students, plus teachers and chaperones, from schools statewide attended Science on the Green and participated in their choice of 20 different activities and field trips.

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN VERMONT[1, 2]

(Thousand metric tons and thousand dollars)

Mineral	2003		2004		2005	
	Quantity	Value	Quantity	Value	Quantity	Value
Gemstones	NA	1	NA	1	NA	1
Sand and gravel, construction	4,520	21,100	4,970	24,000	5,240	32,000
Stone:						
Crushed	4,290	23,900	5,110	30,800	5,480 [3]	37,000 [3]
Dimension	102	26,700	100	30,600	98	27,800
Talc, crude	W	(4)	W	(4)	W	(4)
Total	XX	71,800	XX	85,400	XX	96,800

NA Not available. W Withheld to avoid disclosing company proprietary data. XX Not applicable.

[1]Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

[2]Data are rounded to no more than three significant digits; may not add to totals shown.

[3]Excludes crushed slate; value withheld to avoid disclosing company proprietary data.

[4]Value excluded to avoid disclosing company proprietary data.

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TABLE 2
VERMONT: CRUSHED STONE SOLD OR USED, BY KIND[1]

Kind	2004 Number of quarries	2004 Quantity (thousand metric tons)	2004 Value (thousands)	2005 Number of quarries	2005 Quantity (thousand metric tons)	2005 Value (thousands)
Limestone[2]	6	1,400	$7,840	6	1,380	$9,010
Dolomite	3	757	6,300	3	878	5,940
Granite	3	258	2,250	2	303	2,130
Marble	1	1,910	7,770	1	2,030	13,700
Quartzite	2	W	W	2	887	6,190
Slate	1	W	W	1	(3)	(3)
Total	XX	5,110	30,800	XX	5,480	37,000

W Withheld to avoid disclosing company proprietary data; included in "Total." XX Not applicable.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes limestone-dolomite reported with no distinction between the two.
[3]Withheld to avoid disclosing company proprietary data.

TABLE 3
VERMONT: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2005, BY USE[1]

(Thousand metric tons and thousand dollars)

Use	Quantity	Value
Construction:		
Coarse aggregate (+1½ inch):		
Riprap and jetty stone	W	W
Filter stone	W	W
Other coarse aggregates	6	25
Total	15	136
Coarse aggregate, graded:		
Concrete aggregate, coarse	(2)	(2)
Other graded coarse aggregates	15	87
Fine aggregate (-⅜ inch), other	(2)	(2)
Coarse and fine aggregates:		
Graded road base or subbase	W	W
Crusher run or fill or waste	W	W
Other coarse and fine aggregates	245	1,380
Total	375	2,480
Unspecified:[3]		
Reported	980	6,620
Estimated	4,100	28,000
Total	5,070	34,200
Grand total	5,480	37,000

W Withheld to avoid disclosing company proprietary data; included in "Total."
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Withheld to avoid disclosing company proprietary data; included in "Grand total."
[3]Reported and estimated production without a breakdown by end use.

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TABLE 4

VERMONT: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2005, BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)[2]	358	$4,430	$12.39
Asphaltic concrete aggregates and road base materials	798	4,930	6.18
Fill	193	457	2.37
Other miscellaneous uses[3]	293	1,690	5.76
Unspecified:[4]			
Reported	686	4,480	6.52
Estimated	2,900	16,100	5.51
Total or average	5,240	32,000	6.11

[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

[2]Includes plaster and gunite sands.

[3]Includes snow and ice control and filtration.

[4]Reported and estimated production without a breakdown by end use.

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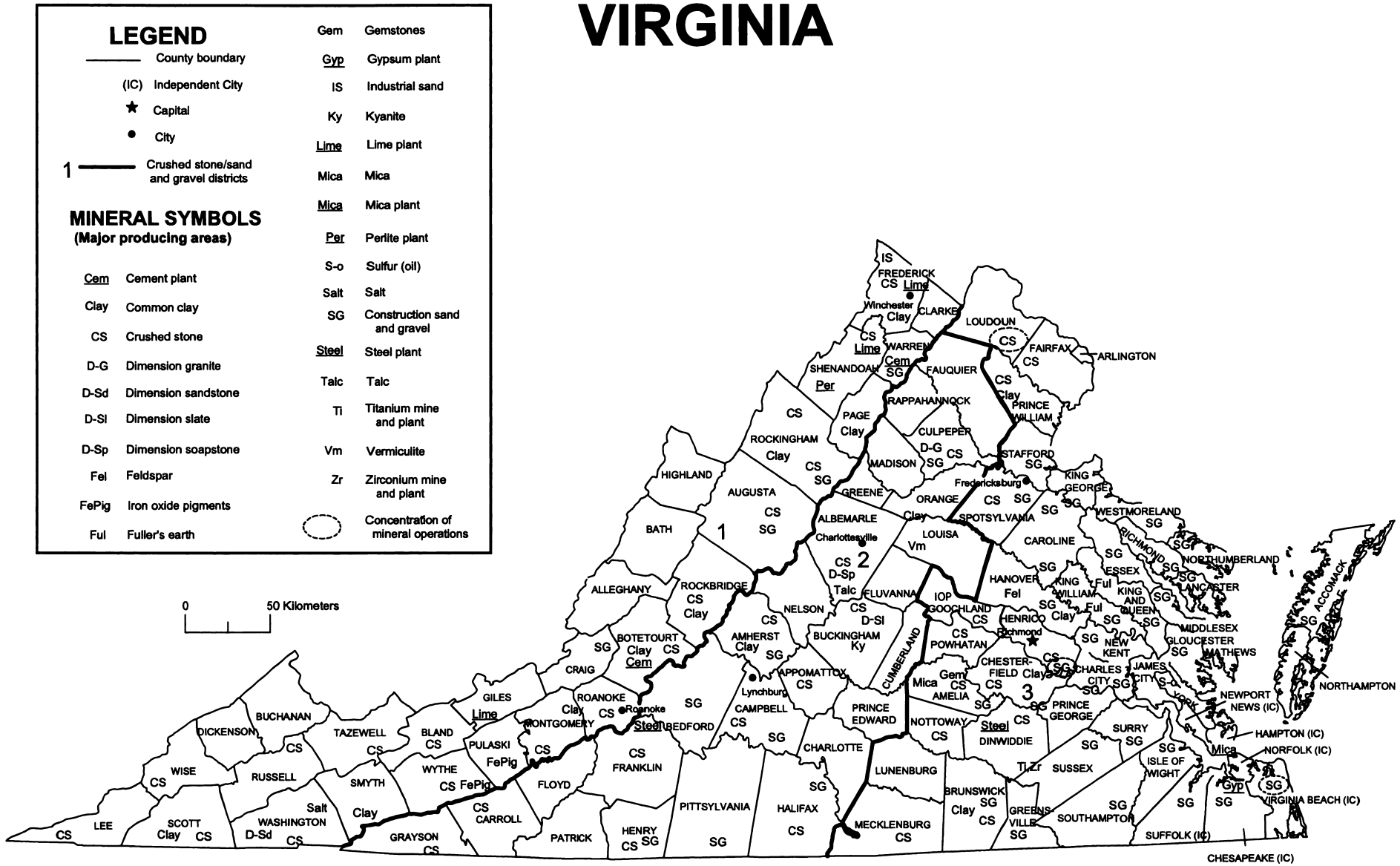
VIRGINIA



Source: Virginia Department of Mines, Minerals and Energy/U.S. Geological Survey (2005)

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THE MINERAL INDUSTRY OF VIRGINIA

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Virginia Department of Mines, Minerals and Energy for collecting information on all nonfuel minerals.

In 2005, Virginia's nonfuel raw mineral production was valued[1] at $1.16 billion, based upon annual U.S. Geological Survey (USGS) data. This was an increase of $269 million, or more than 30%, from the State's total of $891 million in 2004, which was up by 13.4% from that of 2003. Virginia rose to 18th from 19th in rank among the 50 States in total nonfuel raw mineral production value and accounted for more than 2% of the U.S. total.

Crushed stone was, by value, Virginia's leading raw nonfuel mineral, accounting for about 67% of the State's total nonfuel mineral value. From 1990 through 2005, the State produced nearly 981 million metric tons (Mt) of crushed stone, or an average of more than 61 million metric tons per year (Mt/yr) during that 16-year period. With a nearly 12.5-Mt increase in production in 2005 from that of 2004, Virginia's quarries during the past 5 years, on average, have produced nearly 71 Mt/yr of crushed stone. Cement (masonry and portland) was the second leading nonfuel mineral commodity, followed by construction sand and gravel, lime, and zirconium concentrates. These five mineral commodities represented about 93% of the State's total nonfuel mineral value.

In 2005, a $238 million (44%) rise in the value of crushed stone led the State's increase in nonfuel mineral value for the year. This resulted from a 12.5-Mt (17%) production increase and a 23% rise in the average unit value. Substantial increases also took place in the values of cement (masonry and portland) and construction sand and gravel, which were up by about $17 million and $10 million, respectively. As was the case with crushed stone, the unit values of each increased also, construction sand and gravel rising by nearly 21%. Relatively small changes in value took place in zirconium concentrates and fuller's earth, increasing in the former commodity and decreasing in the latter (small decreases in production took place in each commodity). For all the State's other nonfuel mineral commodities, changes in value were significantly smaller and had minimal effect on the net change in total value (table 1).

In 2005, Virginia continued to be the only State to mine and produce kyanite. It also continued to rank 2nd in the production of zirconium in the two zirconium-producing States, and of ilmenite in the two ilmenite-producing States, and of crude vermiclulite in the two crude vermiculite-producing States, as well as of feldspar produced. It ranked 4th in the production of iron oxide pigments and 10th in the production of common clays. The State rose in rank to 10th from 11th in the production of lime and was 8th (5th in 2004) in crushed stone and 5th (4th in 2004) in fuller's earth (within rankings, commodities are listed in descending order of value). Additionally, the State was a producer of significant quantities of portland cement, construction sand and gravel, masonry cement, and industrial sand and gravel (in descending order of value). Although the only producing kyanite mine and calcined kyanite (mullite) facilities in the United States were in Virginia, synthetic mullite, which, in USGS terminology is a calcined bauxitic kaolin, was produced in one other State. About 90% of the U.S. kyanite and mullite output was used in refractories, mostly for the smelting and processing of a variety of metals (60% to 65% in ironmaking and steelmaking), as well as in the manufacture of chemicals, glass and high-temperature ceramics, and other materials.

The following narrative information was provided by the Virginia Division of Mineral Resources[2] (VDMR) of the Commonwealth of Virginia's Department of Mines, Minerals and Energy (DMME); much of the data are based on DMME's own estimates, surveys, and information gathered from company annual reports. Data or information as reported by the DMME are based on the Department's own estimates and information gathering processes and may differ from USGS estimates and production figures.

Commodity Review

Industrial Minerals

Crushed Stone.—Crushed stone production in 2005 increased by more than 5% from production reported in 2004 to about 76.4 Mt. Vulcan Construction Materials LP remained the leading producer of crushed stone in the State, reporting total production of 24.5 Mt in 2005. Luck Stone Corporation was a close second with 21.9 Mt produced statewide. Vulcan's Manassas Quarry in Prince William County was the leading operation, reporting production of about 4.6 Mt for 2005. As was the case in 2004, Loudoun County led the State in crushed stone production with a total of 9.6 Mt from five active operations.

Iron Oxide Pigments.— Production of natural iron oxide pigments continued during 2005 at three locations in Virginia. Hoover Color Corporation produced both crude and finished iron oxide pigments at the Hiwassee Mine and processing facility in Pulaski County and crude iron oxide pigments from an open pit in Wythe County. Total production of crude iron oxide pigments from both mine facilities for 2005 was about 270 metric tons (t). In Goochland County, Minerals and Chemicals Corporation mined ocherous oxides from soil

[1]The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2005 USGS mineral production data published in this chapter are those available as of December 2006. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—can be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

[2]William L. Lassetter, Jr., Economic Geology Section Manager with the Virginia Division of Mineral Resources, authored the text of the State mineral industry information provided by that State agency.

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developed over amphibolite gneiss bedrock and produced about 340 t of product.

Kyanite.—Kyanite Mining Corporation operated surface mines in Buckingham County and during 2005, remained the world's leading producer of kyanite. At the Willis Mountain–East Ridge complex, kyanite is mined from two pits. Ore processing and beneficiation includes comminution by crushing and grinding; froth flotation cells to separate pyrite, sand, and mica; drying and roasting in a reduced atmosphere; followed by magnetic separation to remove iron impurities. This process results in a 35-mesh product that is about 95% pure kyanite and ready for shipment. Refined kyanite is also transported to the company's kiln facility and railhead in Dillwyn, where it is calcined to produce synthetic mullite. During 2005, about 117,000 t of kyanite was produced, and out of that amount, approximately 15,000 t of mullite was produced. Plans are underway to increase the total capacity of calcined kyanite production to about 32,000 metric tons per year (t/yr). Products are shipped by truck and rail to a wide variety of domestic and international customers. Based on total kyanite production capacity of about 136,000 t/yr, the company estimates at least 50 years of minable reserves.

Dimension Stone.— Dimension stone, includes natural rock that is selected or quarried, cut and then shaped for specific building, construction, and other specialty applications, was produced at seven mining operations in Virginia during 2005. In Culpeper County, a total of about 11,000 t of stone blocks were produced from Jurassic-age diabase at the Aston Jet Mist and Virginia Mist quarries Jet Mist is marketed by New England Stone LLC. Virginia Mist is marketed by the R.E.D. Graniti Group, which is headquartered in Massa, Italy. In Albemarle County, New World Stone Company processed about 700 t of soapstone from previously mined stockpiles. About 2,300 t of sandstone was mined in Washington County at the Boulder Look Stone operation. Starting in 2005, the Stonewall Division of Frazier Quarry in Rockingham County began producing natural stone slabs and split blocks of limestone "bluestone" for building and landscaping applications. Slate produced by Lesueur-Richmond Slate Corporation in Buckingham County is sold for use as roofing shingles and other architectural applications.

Salt.— According to information provided by the DMME, salt is being extracted from brines pumped from historic underground salt caverns that have been developed as a natural gas storage facility operated by the Saltville Gas Storage Compnay, LLC in Washington County. During 2005, the Saltville Gas Storage Company was acquired by the Spectra Energy Corporation. Salt is produced by evaporation at an onsite evaporator plant with a designed flow-through capacity of about 400 gallons per minute. Salt production in 2005 was reported to be about 35,000 t, which was down substantially from the approximately 62,000 t produced in 2004.

Vermiculite.—Virginia Vermiculite, LLC continued operations from an open pit mine located in Louisa County, which is one of three active mines in the United States that produce vermiculite concentrate. Production during 2005 was reported to be about 33,300 t, up slightly from the 32,000 t reported in 2004. A new processing plant replaced the existing milling, washing, drying, and screening facility in the second half of 2005.

Metals

Gold.— The Gold Crown Mining Company's Kentuck Mine, a small open pit gold mine in Pittsylvania County, was reclaimed and closed in late 2005. Exploratory work and very minor production of gold was reported during the time period that the mine permit was active between 1995 and 2005.

Titanium and Zirconium.—Titanium-bearing minerals (ilmenite, rutile, leucoxene) and zircon concentrates are being produced by Iluka Resources Limited at the Old Hickory Mine located in Dinwiddie County. The mining permit covers 1,150 hectares (3,731 acres), and the primary facilities include two wet mineral concentrators and a dry mineral separation plant. In their annual report for 2005, Iluka reported production of 270,000 t of ilmenite and 69,000 t of zircon from the operation. Rutile and leucoxene are blended into the ilmenite concentrate. Remaining mineral resources (measured plus indicated) were reported to be 53 Mt at yearend 2005 (Iluka Resources Limited, 2005§[3]). A priority during 2006 will be to complete feasibility studies for a new mining operation at Brink, which is located about 31 kilometers (km) (19 miles) to the south of the Old Hickory Mine area. During 2005, Iluka made plans to close mineral sand mining operations in Florida and Georgia, which will leave Virginia as the only State in the United States where titanium feedstocks and zircon are actively mined.

Government Programs and Activities

The VDMR serves as the Commonwealth's geological survey. As part of DMME, the VDMR continued activities during 2005 to advance the department's mission of enhancing the development and conservation of energy and mineral resources in a safe and environmentally sound manner to support a more productive economy. These activities included geologic mapping programs, compilation and analysis of mineral production statistics, inventorying the locations and geologic characteristics of historic mining activities, and mineral resource quantitative assessments.

With cooperative funding from the USGS STATEMAP program, geologic mapping and digital map compilation were focused along the Interstate 81 (I-81) corridor, a nearly 500-km (300-statute mile) highway that is slated for expansion. STATEMAP is a component of the congressionally mandated National Cooperative Geologic Mapping Program (NCGMP), through which the USGS distributes Federal funds to support geologic mapping efforts through a competitive funding process. The NCGMP has three primary components: (1) FEDMAP, which funds Federal geologic mapping projects, (2) STATEMAP, which is a matching-funds grant program with State geological surveys, and (3) EDMAP, a matching-funds

[3]A reference that includes a section mark (§) is found in the Internet Reference Cited section.

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grant program with universities that has a goal to train the next generation of geologic mappers.

The ongoing survey of active and abandoned mine sites in the State has provided new records for the Mineral Resources of Virginia database. This database serves as a critical resource for analyzing the spatial distribution of a wide variety of mineral resources and the implications for public safety and environmental concerns. With respect to the locations of active and abandoned underground coal mines, DMME continued to develop a Geographic Information System (GIS) containing scanned, catalogued, and georeferenced mine maps acquired from coal companies, State and Federal agencies, consultants, and the general public. Funding from the Federal Mine Safety and Health Administration and as the Federal Office of Surface Mining has supported this project.

During 2005, the VDMR participated in the USGS National Coal Resources Database System (NCRDS) State Cooperative Program. Working with USGS scientists from the Eastern Energy Resources Team, coal resource information in the database has been recorrelated with the revised stratigraphic framework for the Virginia portion of the Appalachian Basin. The VDMR has also provided geospatial information for many of the most productive coal beds in the Southwest Virginia Coalfield to support ongoing coal bed assessment studies.

In 2005, the VDMR produced several reports including: Publication 172, Geology of the Damascus and Laurel Bloomery Quadrangles, Virginia; Open File Report 05-4, Mineral and Fossil Fuel Production in Virginia (1999-2003); and Open File Report 05-5, Preliminary Surficial Geologic Map of the Grottoes Quadrangle, Virginia. Information on these and other DVMR publications may be found on the VDMR Web site at https://www.dmme.virginia.gov/commerce/PublicationCat.aspx.

Internet Reference Cited

Iluka Resources Limited, 2005, Concise annual report 2005, accessed February 7, 2008, at URL http://216.139.227.101/interactive/ilu2005/ilu2005/md/doc.php?n=20&even=1.

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN VIRGINIA[1,2]

(Thousand metric tons and thousand dollars)

Mineral	2003		2004		2005	
	Quantity	Value	Quantity	Value	Quantity	Value
Clays:						
Bentonite	--	--	5	W	--	--
Common	958	2,530	994	4,640	983	4,690
Kyanite[e]	90	13,400	90	13,400	90	13,400
Sand and gravel, construction	11,300	65,500	12,800	75,800	12,000	85,800
Stone:						
Crushed	66,500	481,000	73,700 [r,3]	540,000 [r,3]	86,200	778,000
Dimension	6	651	5	594	6	631
Talc, crude	--	--	--	--	1	15
Combined values of cement, clays (fuller's earth), feldspar, gemstones, iron oxide pigments (crude), lime, sand and gravel (industrial), titanium concentrates (ilmenite), vermiculite (crude), zirconium concentrates (zicron) , and value indicated by symbol W	XX	223,000	XX	256,000 [r]	XX	272,000
Total	XX	786,000	XX	891,000 [r]	XX	1,160,000

[e] Estimated. [r] Revised. W Withheld to avoid disclosing company proprietary data. Withheld value included in "Combined values" data. XX not applicable. -- Zero.
[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2] Data are rounded to no more than three significant digits; may not add to totals shown.
[3] Excludes certain stones; kind and value included with "Combined values" data.

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TABLE 2
VIRGINIA: CRUSHED STONE SOLD OR USED, BY KIND[1]

Kind	2004 Number of quarries	2004 Quantity (thousand metric tons)	2004 Value (thousands)	2005 Number of quarries	2005 Quantity (thousand metric tons)	2005 Value (thousands)
Limestone[2]	44	20,500 r	$141,000 r	45	29,000	$260,000
Dolomite	6	3,460 r	16,100 r	7	3,400	27,900
Marble	-- r	-- r	-- r	--	--	--
Granite	27	30,300 r	233,000 r	26	31,200	291,000
Sandstone and quartzite	5	2,040	14,300	5	2,180	19,900
Traprock	10	16,700	128,000	10	18,600	164,000
Slate	1	192 r	4,370 r	1	136	1,240
Miscellaneous stone	2	441 r	3,050 r	3	1,640	13,500
Total	XX	73,700 r	540,000 r	XX	86,200	778,000

rRevised. XX Not applicable. -- Zero.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes limestone-dolomite reported with no distinction between the two.

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TABLE 3
VIRGINIA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2005, BY USE[1]

(Thousand metric tons and thousand dollars)

Use	Quantity	Value
Construction:		
Coarse aggregate (+1½ inch):		
Macadam	W	W
Riprap and jetty stone	629	9,070
Filter stone	944	9,950
Other coarse aggregate	1,250	11,000
Total	2,820	30,100
Coarse aggregate, graded:		
Concrete aggregate, coarse	6,920	67,000
Bituminous aggregate, coarse	3,980	34,900
Bituminous surface-treatment aggregate	1,760	16,200
Railroad ballast	501	4,710
Other graded coarse aggregate	3,100	30,100
Total	16,200	153,000
Fine aggregate (-⅜ inch):		
Stone sand, concrete	584	4,520
Stone sand, bituminous mix or seal	813	5,890
Screening, undesignated	1,620	11,400
Other fine aggregate	996	8,440
Total	4,010	30,200
Coarse and fine aggregates:		
Graded road base or subbase	7,940	69,000
Unpaved road surfacing	378	2,840
Crusher run or fill or waste	2,460	18,500
Other coarse and fine aggregates	3,010	24,100
Total	13,800	114,000
Other construction materials	56	379
Agricultural:		
Agricultural limestone	356	3,250
Other agricultural uses	30	247
Total	386	3,500
Chemical and metallurgical:		
Lime manufacture	(2)	(2)
Chemical stone	(2)	(2)
Special, mine dusting or acid water treatment	(2)	(2)
Other miscellaneous uses and other specified uses not listed	210	2,120
Unspecified:[3]		
Reported	29,600	261,000
Estimated	19,000	170,000
Total	48,200	431,000
Grand total	86,200	778,000

W Withheld to avoid disclosing company proprietary data; included with "Other coarse aggregates."
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Withheld to avoid disclosing company proprietary data; included in "Grand total."
[3]Reported and estimated production without a breakdown by end use.

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TABLE 4
VIRGINIA : CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2005, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Construction:						
Coarse aggregate (+1½ inch)[2]	919	8,050	W	W	W	W
Coarse aggregate, graded[3]	2,760	23,200	W	W	W	W
Fine aggregate (-⅜ inch)[4]	1,490	12,500	W	W	W	W
Coarse and fine aggregates[5]	3,470	29,500	W	W	W	W
Other construction materials	33	162	23	217	--	--
Agricultural[6]	W	W	W	W	W	W
Chemical and metallurgical[7]	W	W	--	--	--	--
Special[8]	W	W	--	--	--	--
Other miscellaneous uses	--	--	--	--	210	2,120
Unspecified:[9]						
Reported	2,780	25,400	6,530	56,500	20,300	179,000
Estimated	18,000	161,000	939	8,600	--	--
Total	29,800	275,000	14,100	114,000	42,300	389,000

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes filter stone, macadam, riprap and jetty stone, and other coarse aggregates.

[3]Includes bituminous aggregate (coarse), bituminous surface-treatment aggregate, concrete aggregate (coarse), railroad ballast, and other graded coarse aggregates.

[4]Includes screening (undesignated), stone sand (bituminous mix or seal), stone sand (concrete), and other fine aggregates.

[5]Includes crusher run or fill or waste, graded road base or subbase, unpaved road surfacing, and other coarse and fine aggregates.

[6]Includes agricultural limestone and other agricultural uses.

[7]Includes chemical stone and lime manufacture.

[8]Includes mine dusting or acid water treatment.

[9]Reported and estimated production without a breakdown by end use.

TABLE 5
VIRGINIA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2005, BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate and concrete products[2]	5,600	$47,500	$8.49
Asphaltic concrete aggregates and other bituminous mixtures	1,150	7,370	6.42
Road base and coverings	224	1,120	5.01
Fill	633	2,980	4.71
Other miscellaneous uses[3]	182	1,430	7.85
Unspecified:[4]			
Reported	2,770	15,900	5.76
Estimated	1,490	9,410	6.34
Total or average	12,000	85,800	7.13

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes plaster and gunite sands.

[3]Includes roofing granules and snow and ice control.

[4]Reported and estimated production without a breakdown by end use.

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TABLE 6
VIRGINIA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2005,
BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregates and concrete products[2]	W	W	W	W	5,350	45,100
Asphaltic concrete aggregates and other bituminous mixtures	W	W	W	W	809	4,760
Road base and coverings	W	W	W	W	171	829
Fill	9	11	--	--	624	2,970
Other miscellaneous uses[3]	553	4,770	141	963	124	1,010
Unspecified:[4]						
Reported	19	161	--	--	2,750	15,800
Estimated	310	1,970	690	4,370	485	3,080
Total	891	6,910	830	5,330	10,300	73,500

W Withheld to avoid disclosing company proprietary data; included in "Other miscellaneous uses." -- Zero.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes plaster and gunite sands.
[3]Includes roofing granules and snow and ice control.
[4]Reported and estimated production without a breakdown by end use.

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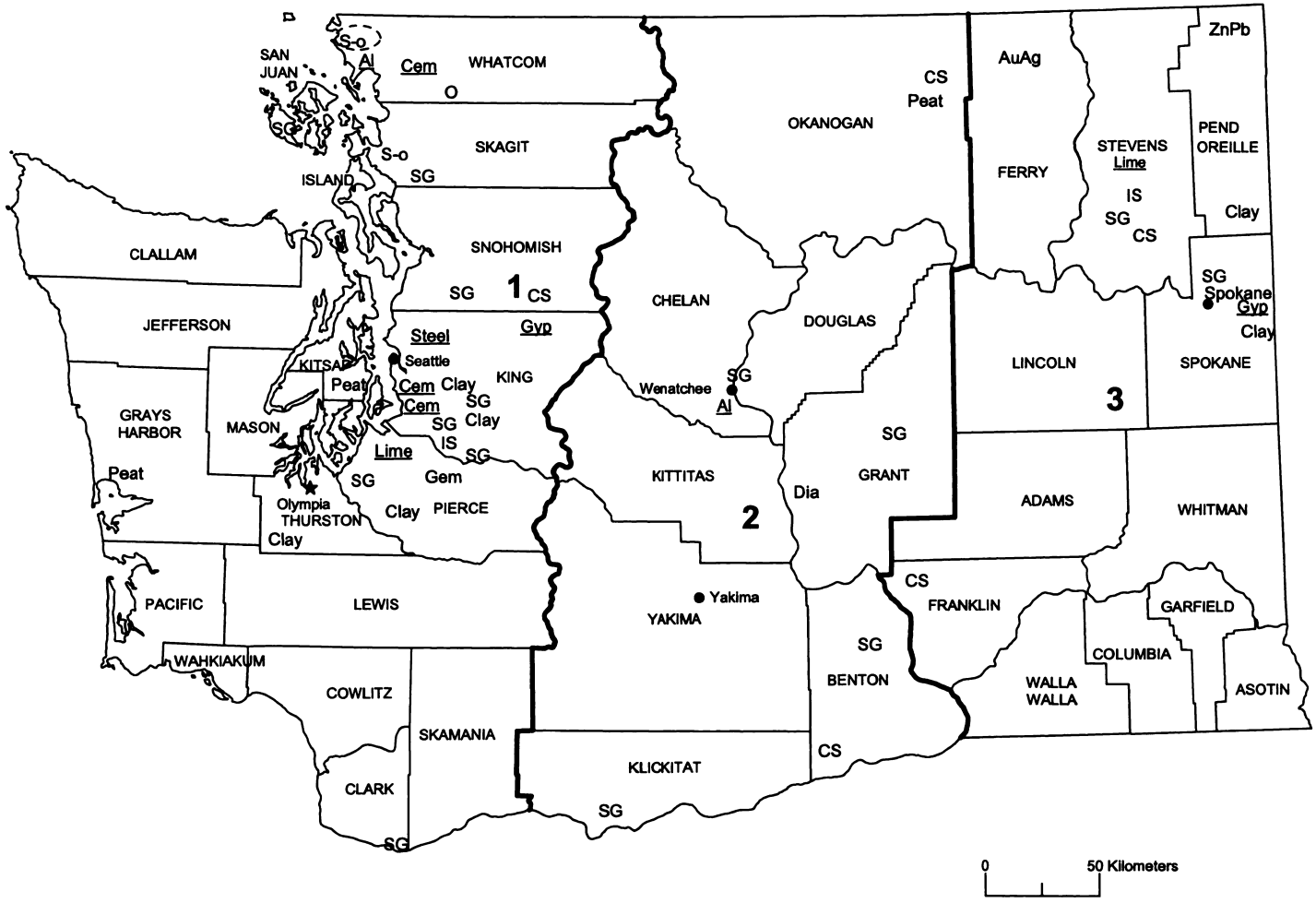
WASHINGTON



LEGEND

- County boundary
- ★ Capital
- ● City
- 1 —— Crushed stone/sand and gravel districts

MINERAL SYMBOLS
(Major producing areas)

Al	Aluminum plant
AuAg	Gold and Silver
Cem	Cement plant
Clay	Common clay
CS	Crushed stone
Dia	Diatomite
Gem	Gemstones
Gyp	Gypsum plant
ISG	Industrial sand and gravel
Lime	Lime plant
O	Olivine
Peat	Peat
S-o	Sulfur (oil)
SG	Construction sand and gravel
Steel	Steel plant
ZnPb	Zinc and lead

Source: Washington State Division of Geology and Earth Resources/U.S. Geological Survey (2005)

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THE MINERAL INDUSTRY OF WASHINGTON

In 2005, Washington's nonfuel raw mineral production was valued[1] at $633 million, based upon annual U.S. Geological Survey (USGS) data. This was a nearly 25% increase of $126 million from that of 2004, which was up 28%, or $111 million, from 2003. The State continued to be 30th in rank among the 50 States in total nonfuel mineral production value and accounted for more than 1% of the U.S. total value.

In 2005, based upon value, Washington's leading nonfuel mineral commodities were, in descending order of value, construction sand and gravel, crushed stone, portland cement, zinc, and gold; the two aggregate commodities accounted for 60% of the State's total nonfuel mineral value. Substantial increases took place in the values of the first four, offset only somewhat by a more than 25% decrease in the value of gold. The largest increase took place in construction sand and gravel. A 15% increase in production led to a $55 million, or nearly 24% increase in the commodity's value. The third-largest increase in value was in that of crushed stone; a 14% increase in production resulted in a nearly $21 million, or 28% increase in its value (table 1). This was followed by portland cement; although portland cement production decreased slightly, its value rose by more than $8 million. Smaller yet significant increases also took place in the production and values of lime, lead, olivine, and industrial sand and gravel; only the values of gold and silver decreased in 2005.

Production of zinc substantially increased at Teck Cominco Limited's Pend Oreille Mine in northeastern Washington, the State's only active zinc and lead mine. The value of zinc rose more than $30 million from that of 2004; lead production and value also increased significantly. In 2004, primary metal mine production had resumed in the State with the opening of the Pend Oreille Mine and as well as the resumption of gold and silver production at Kinross Gold Corp.'s Kettle River Mine near Curlew in Ferry County. Teck Cominco began commercial zinc and lead production in August 2004; Kinross Gold, having recommenced operations at Kettle River in late 2003, resumed gold and silver production there in 2004.

In 2005, mainly owing to lower ore grades and recovery rates, the production and values of gold and silver at Kettle River (the Emanuel Creek deposit) dropped off. Mining at Emanuel Creek was completed in November and the mill temporarily shutdown. With the mine on care and maintenance beginning in November 2005, the remaining staff focused on the permitting and engineering of the Buckhorn gold deposit in northcentral Washington, approximately 70 kilometers by road from the Company's Kettle River mill. Kinross anticipated production to commence at Buckhorn following finalization of its acquisition of Crown Resources Corp. (owner of Buckhorn) and completion of the mine permitting, then in process (Kinross Gold Corp., 2006§[2]).

In 2005, Washington was the only State that produced olivine, and it continued to be second in the quantities of cadmium (byproduct) of 4 producing States, fourth of 4 diatomite-producing States, fourth among 5 States in the quantities of lead produced, and sixth of 10 gold-producing States. Washington rose to 2d from 3d in zinc production in 2005, and to 8th from 9th in construction sand and gravel; it decreased to 10th from 9th in the production of silver. Additionally, significant quantities of crushed stone, portland cement, and industrial sand and gravel continued to be produced in the State. Primary aluminum and raw steel were produced in the State, but both metals were processed from materials acquired from foreign and other domestic sources. In 2005, with a more than 60% increase in primary aluminum production, the State rose in rank to 8th from 11th among 12 producing States. Much of this increase in production was the result of the reopening of Alcoa, Inc.'s mid-State smelter in Wenatchee, idled since July 2001. On October 1, a labor agreement was reached between Alcoa, the United Steelworkers of America (USWA), and the Aluminum Trades Council of Wenatchee, WA, the two latter entities of which represented approximately 400 idled workers at the Wenatchee smelter (Alcoa, Inc., 2004a). Seven days later, the affected workers voted to accept the agreement, after which the company took immediate steps to begin ramping up two of the facilities four potlines and restart the smelter (Alcoa, Inc., 2004b). By the end of January 2005, the two potlines were operating and, as planned, were in full operation by mid-2005, representing approximately 93,000 metric tons per year of primary aluminum (Alcoa, Inc., 2005).

Internet References Cited

Alcoa, Inc., 2004a (October 1), Alcoa and unions reach accord on Wenatchee, saving 400 jobs, accessed October 5, 2007, at URL http://www.alcoa.com/ingot/en/news/releases/wenatchee.asp.

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Alcoa, Inc., 2005 (September 6), Power failure disrupts Wenatchee, WA production, accessed October 9, 2007, at URL http://www.alcoa.com/global/en/news/news_detail.asp?pageID=20050906005772en&newsYear=2005.

Kinross Gold Corp., 2006, 2005 annual report—Kinross Gold Corporation, accessed August 2, 2007, at URL http://www.kinross.com/investors/financials/pdf/05-ar.pdf.

[1]The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2005 USGS mineral production data published in this chapter are those available as of December 2006. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—can be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

[2]References that include a section mark (§) are included in the Internet Reference Cited section.

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TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN WASHINGTON[1, 2]

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral	2003		2004		2005	
	Quantity	Value	Quantity	Value	Quantity	Value
Clays, common	83	204	W	W	W	W
Gemstones	NA	44	NA	44	NA	44
Sand and gravel, construction	40,700	216,000	41,500	227,000	47,200	282,000
Stone, crushed	12,000	73,700	12,100 r	75,500 r	13,900	96,300
Combined values of cadmium byproduct in zinc concentrates (2004-05), cement (portland), diatomite, gold (2004-05), lead (2004-05), lime, olivine, peat, sand and gravel (industrial), silver (2004-05), stone (dimension miscellaneous [2004-05]), zinc, (2004-05), and values indicated by symbol W	XX	107,000	XX	205,000	XX	255,000
Total	XX	396,000	XX	507,000 r	XX	633,000

rRevised. NA Not available. W Withheld to avoid disclosing company proprietary data. Withheld values included in "Combined values" data. XX Not applicable.
[1]Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2]Data are rounded to no more than three significant digits; may not add to totals shown.

TABLE 2
WASHINGTON: CRUSHED STONE SOLD OR USED, BY KIND[1]

Kind	2004			2005		
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Number of quarries	Quantity (thousand metric tons)	Value (thousands)
Limestone[2]	18	2,000	$12,700	18	2,120	$13,200
Dolomite	23	201	916	29	198	854
Marble	2	230	1,670	2	217	1,520
Granite	7	862	5,260 r	5	539	3,890
Sandstone	3	W	W	3	W	W
Traprock	56	8,070 r	51,700 r	56	9,300	62,400
Volcanic cinder and scoria	1	70	387	1	42	298
Slate	1	W	W	1	W	W
Miscellaneous stone	6	311	1,080	11	1,050	7,300
Total	XX	12,100 r	75,500 r	XX	13,900	96,300

rRevised. W Withheld to avoid disclosing company proprietary data; included in "Total." XX Not applicable.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes limestone-dolomite reported with no distinction between the two.

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TABLE 3

WASHINGTON: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2005, BY USE[1]

(Thousand metric tons and thousand dollars)

Use	Quantity	Value
Construction:		
Coarse aggregate (+1½ inch):		
Macadam	W	W
Riprap and jetty stone	123	1,120
Filter stone	25	240
Other coarse aggregates	828	4,310
Total	976	5,670
Coarse aggregate, graded:		
Bituminous aggregate, coarse	(2)	(2)
Bituminous surface-treatment aggregate	46	484
Railroad ballast	272	1,990
Other graded coarse aggregates	564	3,840
Total	882	6,310
Fine aggregate (-⅜ inch):		
Screening, undesignated	(3)	(3)
Other fine aggregate	(3)	(3)
Total	86	969
Coarse and fine aggregate:		
Graded road base or subbase	719	4,580
Unpaved road surfacing	613	3,350
Crusher run or fill or waste	(3)	(3)
Roofing granules	(3)	(3)
Other coarse and fine aggregates	298	2,140
Total	1,870	11,600
Other construction materials	69	306
Agricultural, limestone	(4)	(4)
Chemical and metallurgical:		
Cement manufacture	(4)	(4)
Lime manufacture	(4)	(4)
Flux stone	(4)	(4)
Chemical stone	(4)	(4)
Glass manufacture	(4)	(4)
Special, asphalt fillers or extenders	(4)	(4)
Unspecified:[5]		
Reported	4,390	31,100
Estimated	4,500	30,000
Total	8,910	61,200
Grand total	13,900	96,300

W Withheld to avoid disclosing company proprietary data; included with "Other coarse aggregate."

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Withheld to avoid disclosing company proprietary data; included with "Other graded coarse aggregate."

[3]Withheld to avoid disclosing company proprietary data; included in "Total."

[4]Withheld to avoid disclosing company propreitary data; included in "Grand total."

[5]Reported and estimated production without a breakdown by end use.

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TABLE 4
WASHINGTON: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2005, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3		Unspecified districts	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Construction:								
Coarse aggregate (+1½ inch)[2]	W	W	W	W	W	W	--	--
Coarse aggregate, graded[3]	W	W	W	W	W	W	--	--
Fine aggregate (-⅜ inch)[4]	W	W	W	W	W	W	--	--
Coarse and fine aggregate[5]	1,000	6,520	496	2,960	375	2,130	--	--
Other construction materials	57	250	--	--	12	56	--	--
Agricultural[6]	--	--	--	--	W	W	--	--
Chemical and metallurgical[7]	W	W	--	--	W	W	--	--
Special[8]	--	--	--	--	W	W	--	--
Unspecified:[9]								
Reported	789	5,800	2,120	15,000	1,410	9,930	58	360
Estimated	3,500	24,000	505	3,500	38	264	432	2,300
Total	7,760	50,500	3,210	22,200	2,450	20,900	490	2,650

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes filter stone, macadam, riprap and jetty stone, and other coarse aggregate.
[3]Includes bituminous aggregate (coarse), bituminous surface-treatment aggregate, railroad ballast, and other graded coarse aggregate.
[4]Includes screening (undesignated) and other fine aggregates.
[5]Includes crusher run or fill or waste, graded road base or subbase, roofing granules, unpaved road surfacing, and other coarse and fine aggregates.
[6]Includes agricultural limestone.
[7]Includes cement and lime manufacture, chemical stone, flux stone, and glass manufacture.
[8]Includes asphalt fillers or extenders.
[9]Reported and estimated production without a breakdown by end use.

TABLE 5
WASHINGTON: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2005, BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	11,300	$80,600	$7.16
Plaster and gunite sands	66	1,490	22.64
Concrete products (blocks, bricks, pipe, decorative, etc.)	14	145	10.36
Asphaltic concrete aggregates and other bituminous mixtures	1,670	15,100	8.99
Road base and coverings[2]	8,300	49,000	5.91
Fill	9,770	38,800	3.97
Snow and ice control	107	721	6.74
Railroad ballast	187	1,290	6.89
Other miscellaneous uses[3]	246	2,420	9.85
Unspecified:[4]			
Reported	8,140	48,400	5.94
Estimated	7,440	43,900	5.90
Total or average	47,200	282,000	5.97

[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.
[2]Includes road and other stabilization (lime).
[3]Includes roofing granules.
[4]Reported and estimated production without a breakdown by end use.

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TABLE 6

WASHINGTON: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2005, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregates (including concrete sand)	10,400	74,400	794	5,730	62	452
Concrete products (blocks, bricks, pipe, decorative, etc.)[2]	W	W	W	W	W	W
Asphaltic concrete aggregates and other bituminous mixtures	1,230	9,720	W	W	W	W
Road base and coverings[3]	5,330	33,100	1,960	11,100	1,010	4,810
Fill	9,560	38,000	191	735	19	106
Snow and ice control	24	180	W	W	W	W
Railroad ballast	132	853	W	W	W	W
Other miscellaneous uses[3]	319	3,990	366	5,070	221	1,310
Unspecified:[4]						
Reported	2,540	18,500	1,960	10,800	3,640	19,100
Estimated	6,540	38,600	308	1,810	591	3,480
Total	36,100	217,000	5,590	35,200	5,540	29,200

W Withheld to avoid disclosing company proprietary data; included in "Other miscellaneous uses."

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes plaster and gunite sands.

[3]Includes road and other stabilization, lime.

[3]Includes roofing granules.

[4]Reported and estimated production without a breakdown by end use.

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WEST VIRGINIA

LEGEND

- County boundary
- ★ Capital
- ● City
- 1 Crushed stone/sand and gravel districts

MINERAL SYMBOLS
(Major producing areas)

Al	Aluminum plant
Cem	Cement plant
Clay	Common clay
CS	Crushed stone
Gyp-s	Synthetic gypsum
IS	Industrial sand
Lime	Lime plant
Peat	Peat
Salt	Salt
SG	Construction sand and gravel
Si	Silicon metal plant
Steel	Steel plant

Source: West Virginia Geological and Economic Survey/U.S. Geological Survey (2005)

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THE MINERAL INDUSTRY OF WEST VIRGINIA

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the West Virginia Geological and Economic Survey for collecting information on all nonfuel minerals.

In 2005 West Virginia's nonfuel raw mineral production was valued[1] at $200 million, based upon annual U.S. Geological Survey (USGS) data. This was up more than 20% from the State's total nonfuel mineral value of $166 million in 2004, which was up 1.2% from that of 2003.

In 2005, crushed stone continued to be West Virginia's leading nonfuel mineral by value, accounting for nearly 50% of the State's total nonfuel mineral production value. Cement (portland and masonry), industrial sand and gravel, lime, and salt followed (in descending order of value). These five mineral commodities accounted for nearly 99% of the State's total value of nonfuel raw mineral production. In 2005, although crushed stone production decreased slightly, the commodity led in the State's significant increase in value with a 37%, or $26.8 million increase from that of 2004. The values of portland cement, masonry cement, and lime also rose, each also having small decreases in production. The total increase for cement was about $5 million and lime increased by nearly $3 million (table 1).

West Virginia was 10th in 2005 (9th in 2004) in the quantity of salt produced and remained a significant producer of crushed stone, industrial sand and gravel, and lime. The State's mines produced industrial minerals and coal; no metals were mined in West Virginia. Primary aluminum and raw steel were produced in the State, but both metals were processed from materials acquired from foreign and other domestic sources. In 2005, West Virginia ranked 10th in the Nation (9th in 2004) in the production of primary aluminum among 12 producing States.

Industry Trends and Developments

According to the West Virginia Geological and Economic Survey (WVGES), West Virginia's total quarry production in 2005 from nonfuel mineral products—comprised of crushed stone (limestone and sandstone), construction and industrial sand and gravel, shale, and sand limestone—was 16.2 million metric tons (Mt) from 50 permitted quarries. Limestone quarries produced about 14 Mt of various products, accounting for about 87% of the total noncoal production based on tonnage. While aggregate, by far, was the largest use for the State's limestone resources, limestone, additionally, was processed for such uses as: agricultural lime and ballast, metallurgical flux, in the production of cement, in steel production, and in flue gas desulfurization, fluidized bed combustion, low silica rock dust for the coal industry, stream revitalization, various chemical applications, and for wastewater treatment (Britton, Blake, and McColloch, 2007, p. 123).

Commodity Review

Industrial Minerals

Crushed Stone.—The majority of West Virginia's limestone production of about 10.3 Mt (based upon WVGES data) was from a northeast-southwest trend in the counties along the eastern border with the State of Virginia. The trend extended northeastward into the State's eastern panhandle along outcrop belts of thick carbonate units of Ordovician, Silurian, Devonian and Mississippian age (spanning an age of from about 480 million years to about 320 million years). The county that produced the most limestone was Monongalia County from which 2.8 Mt of stone was quarried from the Greenbrier Limestone of Mississippian age. In the western portion of the State in Ritchie County (anomalous to the norm of the State's eastern production trend), an underground limestone mine opened from which 592,000 metric tons (t) of stone were extracted; interestingly this source was also the Greenbrier Limestone. Another mine in Harrison County produced 77,000 t of stone from the Upper Pennsylvania Monongahela Formation (Britton, Blake, and McColloch, 2007, p. 123).

Owing to several major highway construction projects, the demand for limestone aggregate was expected to continue to increase. These projects included the Coalfields Expressway in southern West Virginia and the Corridor H project across the east-central mountain portion of the State. Additionally, a number of large construction projects and smaller road projects throughout the State will continue to demand additional aggregate.

Reference Cited

Britton, J.Q., Blake, B.M., Jr., and McColloch, G.H., 2007, West Virginia, *in* Annual review 2006: Mining Engineering, v. 59, no. 5, May, p. 123-125.

[1]The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2005 USGS mineral production data published in this chapter are those available as of December 2006. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—can be retrieved over the Internet at URL http://minerals.usgs.gov/minerals

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TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN WEST VIRGINIA[1, 2]

(Thousand metric tons and thousand dollars)

Mineral	2003		2004		2005	
	Quantity	Value	Quantity	Value	Quantity	Value
Clays, common	142	376	161	441	186	524
Gemstones	NA	1	NA	1	NA	1
Sand and gravel:						
Construction	971	4,750	524	2,500	318	1,630
Industrial	W	W	343	17,300	369	17,800
Stone, crushed	14,100	69,100	14,700	72,600 r	14,500	99,400
Combined values of cement, lime, peat, salt, stone (dimension sandstone), and value indicated by symbol W	XX	90,100	XX	73,500	XX	81,100
Total	XX	164,000	XX	166,000 r	XX	200,000

rRevised. NA Not available. W Withheld to avoid disclosing company proprietary data. Withheld value included in "Combined values" data. XX Not applicable.
[1]Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2]Data are rounded to no more than three significant digits; may not add to totals shown.

TABLE 2
WEST VIRGINIA: CRUSHED STONE SOLD OR USED, BY KIND[1]

Kind	2004			2005		
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Number of quarries	Quantity (thousand metric tons)	Value (thousands)
Limestone	28	13,300 r	$66,300 r	26	13,200	$89,800
Sandstone	8	1,400 r	6,250 r	6	1,260	9,620
Total	XX	14,700	72,600 r	XX	14,500	99,400

rRevised. XX Not applicable.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.

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TABLE 3

WEST VIRGINIA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2005, BY USE[1]

(Thousand metric tons and thousand dollars)

Use	Quantity	Value
Construction:		
Coarse aggregate (+1½ inch):		
Macadam	W	W
Riprap and jetty stone	170	1,370
Filter stone	W	W
Other coarse aggregates	24	233
Total	465	3,650
Coarse aggregate, graded:		
Concrete aggregate, coarse	603	3,870
Bituminous aggregate, coarse	728	5,300
Bituminous surface-treatment aggregate	(2)	(2)
Other graded coarse aggregates	167	1,280
Total	1,500	10,500
Fine aggregate (-⅜ inch):		
Stone sand, concrete	273	1,570
Stone sand, bituminous mix or seal	96	590
Screening, undesignated	205	1,530
Total	574	3,690
Coarse and fine aggregate:		
Graded road base or subbase	W	W
Unpaved road surfacing	W	W
Crusher run or fill or waste	208	1,310
Total	1,190	7,460
Other construction materials	850	5,920
Agricultural, limestone	(3)	(3)
Unspecified:[4]		
Reported	6,270	43,300
Estimated	3,700	25,000
Total	9,920	68,200
Grand total	14,500	99,400

W Withheld to avoid disclosing company proprietary data; included in "Total."

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Withheld to avoid disclosing company preprietary data; included with "Other graded coarse aggregates."

[3]Withheld to avoid disclosing company proprietary data; included in "Unspecified: Reported."

[4]Reported and estimated production without a breakdown by end use.

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TABLE 4

WEST VIRGINIA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2005, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Construction:						
Coarse aggregate (+1½ inch)[2]	W	W	W	W	W	W
Coarse aggregate, graded[3]	W	W	W	W	W	W
Fine aggregate (-⅜ inch)[4]	W	W	W	W	W	W
Coarse and fine aggregate[5]	W	W	W	W	W	W
Other construction materials	850	5,920	--	--	--	--
Agricultural[6]	W	W	--	--	W	W
Unspecified:[7]						
Reported	2,740	18,900	2,580	17,700	942	6,750
Estimated	1,200	8,000	1,700	11,000	813	5,500
Total	5,710	38,800	4,650	31,400	4,140	29,100

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes filter stone, macadam, riprap and jetty stone, and other coarse aggregates.

[3]Includes bituminous aggregate (coarse), bituminous surface-treatment aggregate, concrete aggregate (coarse), and other graded coarse aggregates.

[4]Includes screening (undesignated), stone sand (bituminous mix or seal), and stone sand (concrete).

[5]Includes crusher run or fill or waste, graded road base or subbase, and unpaved road surfacing.

[6]Includes agricultural limestone.

[7]Reported and estimated production without a breakdown by end use.

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WISCONSIN

LEGEND

- County boundary
- ★ Capital
- ● City
- 1 Crushed stone/sand and gravel districts

MINERAL SYMBOLS
(Major producing areas)

Cem	Cement plant
CS	Crushed stone
D-G	Dimension granite
D-L	Dimension limestone
D-Sd	Dimension sandstone
IOP	Iron oxide pigments
IS	Industrial sand
Lime	Lime plant
Peat	Peat
Per	Perlite plant
S-o	Sulfur (oil)
SG	Construction sand and gravel

0 50 Kilometers

Source: Wisconsin Geological and Natural History Survey/U.S. Geological Survey (2005)

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THE MINERAL INDUSTRY OF WISCONSIN

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Wisconsin Geological and Natural History Survey for collecting information on all nonfuel minerals.

In 2005, Wisconsin's nonfuel raw mineral production was valued[1] at $562 million, based upon annual U.S. Geological Survey (USGS) data. This was an 18.3% increase from the State's total nonfuel mineral value for 2004, which had increased nearly 14% from 2003 to 2004. The State ranked 34th (33d in 2004) among the 50 States in total nonfuel mineral production value and accounted for 1% of the U.S. total value. [Because data for peat and portland cement have been withheld (company proprietary data), the actual total values for 2003 to 2005 are somewhat higher than those reported in table 1.]

Crushed stone and construction sand and gravel were (in descending order of value) Wisconsin's leading nonfuel minerals in 2005 (a reversal from the order of 2004), accounting for more than 40% and 34%, respectively, of the State's reportable total nonfuel raw mineral production value (table 1). These were followed by lime, representing about 11% of the total value, industrial sand and gravel, nearly 10%, and dimension stone, nearly 5% of the total value.

The State's top four nonfuel mineral commodities had substantial to moderate increases in unit value, and virtually all the State's mineral commodities rose in production and value in 2005, only peat showing a decrease in value as well as a decrease in production. Both crushed stone and construction sand and gravel production decreased slightly, but their values rose 32% and 7%, respectively, the unit value of crushed stone rising by more than 33%. A 5% increase in industrial sand and gravel production led to a nearly 19% increase in the commodity's value, while a 4.5% increase in lime production resulted in a nearly 14% rise in its value. A nearly 20% increase in dimension stone production led to a 16% increase in the commodity's value (table 1). With a modest increase in portland cement production, its value rose substantially.

In 2005, Wisconsin continued to be third in the quantities of industrial sand and gravel produced and rose to first from second in dimension stone production and to eighth from ninth in that of lime. Although production only marginally decreased, the State dropped to 10th from 7th in construction sand and gravel. Additionally, the State was a significant producer of crushed stone.

The following narrative information was provided by the Wisconsin Geological and Natural History Survey.[2] In 2005, Wisconsin's nonmetallic mineral industry remained strong, led by production of construction aggregates, dimension limestone, and industrial sand. Other minerals and mineral products included lime, dimension sandstone and granite, landscape materials, roofing granules, agricultural lime, peat, specialty aggregates, and clays for construction use. Many mineral producers actively sought permits for new production sites to ensure future reserves and invested in expansion or modernization of existing operations to meet current and future demand. There was no active metallic mining or exploration drilling in Wisconsin in 2005.

Exploration Activities, Discoveries, and Mine Development

In 2005, Wisconsin aggregate producers continued to actively seek new reserves to replace operations that were nearing depletion or could not be expanded owing to encroaching residential development. A prime consideration in aggregate exploration in and around major urban areas such as southeast Wisconsin has become whether permits and zoning can be obtained before development makes mining an impractical land use. Producers of dimension limestone, sandstone, and landscape stone products have followed the lead of the aggregate industry in seeking new reserves in less developed regions where permitting is easier. Industrial sand producers were active in expanding operations and seeking new reserves in anticipation of demand from the drilling and glass industries.

There has been no significant metallic mineral exploration or leasing activity in Wisconsin since the last regulated exploration drill hole was completed in January 1998. Although there has been no metallic exploration activity in Wisconsin, there has been considerable interest in activity in adjacent areas of Upper Michigan. Some interest was also raised in Ashland County by a proposal to restart iron mining in the western Penokee-Gogebic Iron Range. Although active mining ended in 1965, iron mining companies retained ownership of significant acreage of surface and mineral rights with the intention of developing taconite resources in the future.

Commodity Review

Industrial Minerals

Dimension Stone.—Dimension limestone production is

[1]The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2005 USGS mineral production data published in this chapter are those available as of December 2006. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—can be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

[2]Bruce A. Brown, Geologist (nonmetallic minerals), and Thomas J. Evans, Geologist (metallic minerals), both of the Wisconsin Geological and Natural History Survey, coauthored the text of the State mineral industry information provided by that agency.

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concentrated in the Silurian rocks of eastern Wisconsin, centered on the Byron area of Fond du Lac County, the Chilton area of Calumet County, and the Sussex-Lannon area of Waukesha County. Products include a variety of veneer stone colors and styles, paving and flagstone, cut and finished building stone, riprap, and a variety of landscape stone materials. Strong demand for upscale housing has resulted in several producers planning to expand and modernize veneer and paving stone plants. A similar range of building and landscape materials was produced from silica-cemented sandstone beds in the Cambrian-age rocks of central Wisconsin. Output has increased with the opening of one new quarry and plant in Wood County in 2004. The demand for landscape stone has resulted in local quarries, including some aggregate operations, producing rough dimension stone from the Ordovician-age Prairie du Chien and Galena-Platteville limestones. Many sand and gravel producers saved and sold large boulders for landscaping use. Stones for use in landscaping, including glacial boulders, weathered limestone blocks, washed gravel, and grus (disaggregated weathered granite) have become an increasingly lucrative sideline for many aggregate and stone producers.

Quarrying of the well-known red monument granite of the Wausau area, and gray granite from Amberg in Marinette County continued on a limited basis. Cut blocks and slabs are sold to finishers and fabricators because the finishing plants at Wausau are now closed. Precambrian-age hardrock (granite, traprock, quartzite) material is increasingly in demand for breakwater stone, riprap, railroad ballast, roofing granules, aggregates requiring high durability such as seal coat chips, and specialty aggregate for terrazzo and exposed aggregate structural panels.

Industrial Sand and Gravel.—Industrial sand producers experienced a strong demand for foundry sand and an increased demand for hydrofrac sand for the oil industry. In 2005, there was significant interest in prospecting for new sand mines to satisfy the hydrofrac market and to provide material for Wisconsin's glass manufacturers. A range of industrial sand products are produced from the Cambrian-age Galesville sandstone, the Ordovician-age St. Peter sandstone, and from Quaternary-age deposits.

Lime.—The lime industry has remained steady in terms of number of plants, but producers investigated modernizing existing plants and made plans to expand existing quarry operations both for lime production and byproducts such as aggregate and riprap.

Metals

Wisconsin has had no metal mining since the closing of the Flambeau copper mine near Ladysmith in Rusk County in 1997. Following the sale of the undeveloped Crandon massive sulfide deposit to local Native American communities in 2003, Wisconsin Department of Natural Resources (DNR) significantly reduced its metallic mining regulatory program and staff. The only current regulatory activity related to metal mining is long-term monitoring of the reclaimed Flambeau property.

Environmental Issues and Reclamation

In 2005, the DNR convened its Nonmetallic Mining Advisory Committee to begin revisions of Wisconsin's nonmetallic mining reclamation rules (N.R. 135), which required reclamation of all new mines and existing mines operating as of September 1, 2001. By 2005, operators were required to have reclamation plans approved by the county or other administrative authority, and financial assurance in place. The revisions were necessary to remove startup language, clarify differences between operational and reclamation issues, resolve fee-related issues, and strengthen the DNR role in technical dispute resolution. Progress was also made in terms of legislation and rule revisions to streamline the air quality permitting process for portable crushing plants.

Legislation and Government Programs, and Outreach Activities

The aggregate industry was concerned by the diversion of more than $430 million from the Transportation Fund to the General Fund in the 2005-07 biennial budget. When combined with the $675 million diverted in the 2003-05 budget, more than $1.1 billion has been removed from transportation funding. Proposed legislation that repeals gasoline tax indexing and refunds of the fuel tax paid by schools and local governments would further reduce funds available for transportation. Recent bills proposed to limit eminent domain, protect property rights, and streamline the air quality permit application process may have a long-term benefit to the mineral industry.

A law enacted in 2004 requires municipalities or counties doing comprehensive (Smart Growth) planning to notify mine owners and operators of any action that affects future mining operations. Wisconsin's nonmetallic mining reclamation law (Dept. of Natural Resources N.R. 135) provides for registration of mines in operation that have undeveloped nonmetallic mineral deposits in order to protect reserves from future local zoning changes that preclude mining (Wisconsin Department of Natural Resources, 2006§[3]). There was an increase in registration activity in 2005 in reaction to attempts by local governments to use comprehensive planning to eliminate aggregate mining as a permitted land use. The statewide planning process is scheduled to be completed in 2010.

In 2005, the Wisconsin mineral industry continued to recognize the need for good public relations. Large and small operators hosted open house events and educational programs for neighbors and K-12 students from local schools. They provided demonstrations of quarrying activities including blasting and operation of construction equipment. Most events also provided educational activities relating to environmental issues, geology, and the importance of minerals to society.

Internet Reference Cited

Wisconsin Department of Natural Resources, 2006 (November), Nonmetalic Mining Reclamation Chapter NR 135.02, accessed May 28, 2008, at URL http://www.legis.state.wi.us/rsb/code/nr/nr135.pdf.

[3]A reference that includes a section mark (§) is found in the Internet Reference Cited section.

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TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN WISCONSIN[1, 2]

(Thousand metric tons and thousand dollars)

Mineral	2003		2004		2005	
	Quantity	Value	Quantity	Value	Quantity	Value
Cement, portland	W	(3)	W	(3)	W	(3)
Gemstones	NA	6	NA	6	NA	6
Lime	757	46,000	850	53,900	888	61,300
Peat	W	(3)	W	(3)	W	(3)
Sand and gravel:						
Construction	38,500	150,000	43,400	178,000	43,200	191,000
Industrial	1,930	40,200	2,140	47,000	2,250	55,700
Stone:						
Crushed	35,900	160,000	39,300 r	172,000 r	38,900	227,000
Dimension	101	19,700	232	23,800	278	27,600
Total	XX	417,000	XX	475,000 r	XX	562,000

rRevised. NA Not available. W Withheld to avoid disclosing company proprietary data. XX Not applicable.
[1]Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2]Data are rounded to no more than three significant digits; may not add to totals shown.
[3]Value excluded to avoid disclosing company proprietary data.

TABLE 2
WISCONSIN: CRUSHED STONE SOLD OR USED, BY KIND[1]

Kind	2004			2005		
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Number of quarries	Quantity (thousand metric tons)	Value (thousands)
Limestone[2]	157	32,500	$139,000	199	31,800	$187,000
Dolomite	9	1,100	4,980	9	1,000	4,920
Granite	5 r	2,500 r	11,600 r	5	2,740	15,800
Sandstone and quartzite	3	1,490	7,490 r	3	1,580	9,920
Traprock	5	1,780	9,030	4	1,780	9,420
Total	XX	39,300 r	172,000 r	XX	38,900	227,000

rRevised. XX Not applicable.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes limestone-dolomite reported with no distinction between the two.

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TABLE 3

WISCONSIN: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2005, BY USE[1]

(Thousand metric tons and thousand dollars)

Use	Quantity	Value
Construction:		
Coarse aggregate (+1½ inch):		
Macadam	302	1,790
Riprap and jetty stone	176	1,010
Filter stone	367	2,600
Other coarse aggregate	196	875
Total	1,040	6,270
Coarse aggregate, graded:		
Concrete aggregate, coarse	1,260	7,840
Bituminous aggregate, coarse	138	850
Bituminous surface-treatment aggregate	262	1,510
Railroad ballast	W	W
Other graded coarse aggregate	27	224
Total	1,690	10,400
Fine aggregate (-⅜ inch):		
Stone sand, bituminous mix or seal	(2)	(2)
Screening, undesignated	799	4,540
Other fine aggregate	261	884
Total	1,060	5,420
Coarse and fine aggregates:		
Graded road base or subbase	5,640	28,900
Unpaved road surfacing	431	1,470
Crusher run or fill or waste	143	853
Roofing granules	(3)	(3)
Other coarse and fine aggregates	770	2,870
Total	6,980	34,100
Other construction materials	157	7,970
Agricultural:		
Agricultural limestone	229	2,750
Other agricultural uses	17	65
Total	246	2,810
Chemical and metallurgical, lime manufacture	(4)	(4)
Other miscellaneous uses, refractory stone	(4)	(4)
Unspecified:[5]		
Reported	2,510	15,400
Estimated	25,000	144,000
Total	27,500	159,000
Grand total	38,900	227,000

W Withheld to avoid disclosing company proprietary data; included with "Other graded coarse aggregate."

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Withheld to avoid disclosing company proprietary data; included with "Other fine aggregate."

[3]Withheld to avoid disclosing company proprietary data; included with "Other coarse and fine aggregates."

[4]Withheld to avoid disclosing company proprietary data; included in "Grand total."

[5]Reported and estimated production without a breakdown by end use.

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TABLE 4

WISCONSIN: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2005, BY USE AND DISTRICT[1, 2]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3		District 4	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Construction:								
Coarse aggregate (+1½ inch)[3]	W	W	W	W	251	1,410	W	W
Coarse aggregate, graded[4]	W	W	W	W	357	2,000	--	--
Fine aggregate (-⅜ inch)[5]	W	W	W	W	430	1,930	--	--
Coarse and fine aggregate[6]	2,710	16,100	W	W	1,900	8,230	W	W
Other construction materials	--	--	--	--	157	7,970	--	--
Agricultural[7]	W	W	W	W	W	W	--	--
Chemical and metallurgical[8]	--	--	--	--	W	W	--	--
Other miscellaneous uses[9]	--	--	--	--	W	W	--	--
Unspecified:[10]								
Reported	471	3,380	693	4,100	--	--	1,350	7,960
Estimated	3,800	20,000	4,300	25,000	2,800	17,000	1,800	11,000
Total	7,680	43,400	8,720	50,300	6,120	39,300	3,390	19,600

	District 5		District 6		District 8		Unspecified districts	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Construction:								
Coarse aggregate (+1½ inch)[3]	--	--	W	W	W	W	84	368
Coarse aggregate, graded[4]	--	--	W	W	W	W	--	--
Fine aggregate (-⅜ inch)[5]	--	--	--	--	--	--	85	440
Coarse and fine aggregate[6]	--	--	W	W	W	W	267	1,180
Other construction materials	--	--	--	--	--	--	--	--
Agricultural[7]	--	--	--	--	--	--	--	--
Chemical and metallurgical[8]	--	--	--	--	--	--	--	--
Other miscellaneous uses[9]	--	--	--	--	--	--	--	--
Unspecified:[10]								
Reported	--	--	--	--	--	--	--	--
Estimated	8,000	46,000	3,000	17,000	1,300	7,800	--	--
Total	8,000	46,000	3,180	18,100	1,440	8,370	435	1,980

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

[1]No crushed stone was produced in District 7.

[2]Data are rounded to no more than three significant digits; may not add to totals shown.

[3]Includes filter stone, macadam, riprap and jetty stone, and other coarse aggregates.

[4]Includes bituminous aggregate (coarse), bituminous surface-treatment aggregate, concrete aggregate (coarse), railroad ballast, and other graded coarse aggregates.

[5]Includes screening (undesignated), stone sand (bituminous mix or seal), and other fine aggregates.

[6]Includes crusher run or fill or waste, graded road base or subbase, roofing granules, unpaved road surfacing, and other coarse and fine aggregates.

[7]Includes agricultural limestone and other agricultural uses.

[8]Includes lime manufacture.

[9]Includes refractory stone.

[10]Reported and estimated production without a breakdown by end use.

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TABLE 5
WISCONSIN: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2005,
BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	5,980	$28,700	$4.81
Plaster and gunite sands	13	117	9.00
Concrete products (blocks, bricks, pipe, decorative, etc.)	232	1,130	4.87
Asphaltic concrete aggregates and other bituminous mixtures	1,260	4,950	3.92
Road base and coverings	5,870	22,400	3.82
Road and other stabilization (cement and lime)	389	2,370	6.10
Fill	1,890	5,620	2.97
Snow and ice control	221	1,050	4.74
Roofing granules	9	62	6.89
Other miscellaneous uses[2]	98	520	5.32
Unspecified:[3]			
Reported	7,600	40,700	5.36
Estimated	19,600	82,800	4.22
Total or average	43,200	191,000	4.41

[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes filtration.
[3]Reported and estimated production without a breakdown by end use.

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TABLE 6
WISCONSIN: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2005,
BY USE AND DISTRICT[1, 2]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregates and concrete products[2]	1,010	5,430	2,020	9,300	2,040	9,510
Asphaltic concrete aggregates and other bituminous mixtures	W	W	233	812	303	1,070
Road base and coverings[4]	37	153	2,470	11,900	1,330	4,790
Fill	82	187	791	2,890	475	1,050
Snow and ice control	W	W	8	166	69	327
Other miscellaneous uses[5]	145	369		5,240	13	94
Unspecified:[6]						
Reported	220	1,640	5,840	32,200	293	1,430
Estimated	1,680	7,010	2,930	12,200	1,000	4,380
Total	3,170	15,100	14,300	69,500	5,530	22,600

	District 4		Districts 5 and 6		District 7	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregates and concrete products[2]	W	W	476	2,470	W	W
Asphaltic concrete aggregates and other bituminous mixtures	W	W	202	966	W	W
Road base and coverings[4]	145	554	317	1,320	190	662
Fill	104	397	357	688	38	86
Snow and ice control	--	--	59	203	W	W
Other miscellaneous uses[5]	229	1,170	14	55	235	944
Unspecified:[6]						
Reported	1,050	4,160	88	955	42	200
Estimated	4,720	19,800	3,780	16,400	1,500	6,290
Total	6,260	26,100	5,290	23,000	2,010	8,180

	District 8		Unspecified districts	
	Quantity	Value	Quantity	Value
Concrete aggregates and concrete products[2]	422	1,900	--	--
Asphaltic concrete aggregates and other bituminous mixtures	W	W	--	--
Road base and coverings[4]	1,330	4,010	442	1,410
Fill	43	310	--	--
Snow and ice control	W	W	--	--
Other miscellaneous uses[5]	333	1,400	--	--
Unspecified:[6]				
Reported	59	144	--	--
Estimated	3,570	14,900	438	1,840
Total	5,750	22,700	880	3,250

W Withheld to avoid disclosing company proprietary data; included in "Other miscellaneous uses." -- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Districts 5 and 6 are combined to avoid disclosing company proprietary data.

[3]Includes plaster and gunite sands.

[4]Includes road and other stabilization (cement and lime).

[5]Includes filtration and roofing granules.

[6]Reported and estimated production without a breakdown by end use.

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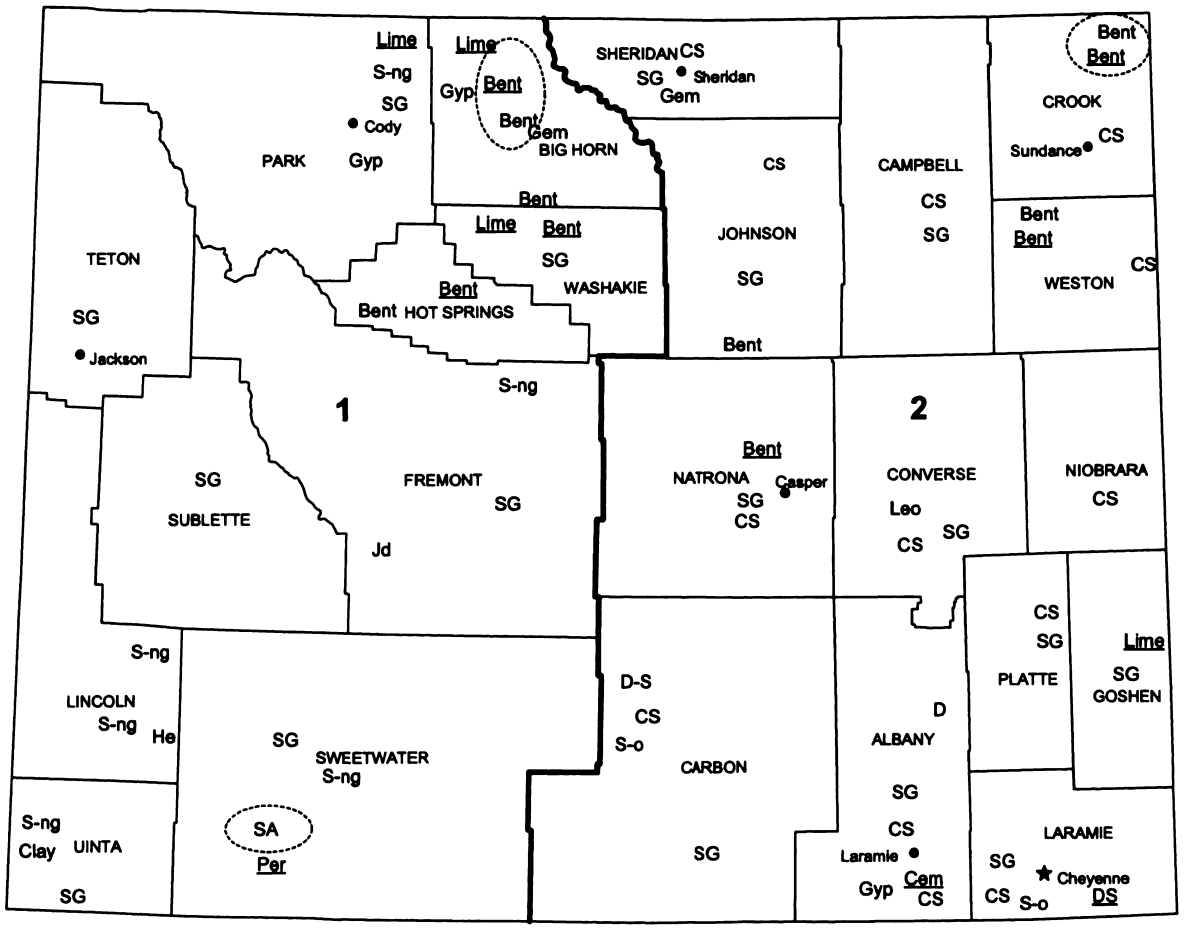
WYOMING



MINERAL SYMBOLS
(Major producing areas)

Bent	Bentonite
Bent	Bentonite plant
Cem	Cement plant
Clay	Common clay
CS	Crushed stone
D-S	Dimension sandstone
DS	Dimension stone plant
Gem	Gemstones
Gyp	Gypsum
He	Helium
Jd	Jade
Leo	Leonardite
Lime	Lime plant
SA	Soda ash
Per	Perlite plant
S-ng	Sulfur (natural gas)
S-o	Sulfur (oil)
SG	Construction sand and gravel
⬭	Concentration of mineral operations

LEGEND

- County boundary
- ★ Capital
- ● City
- 1 — Crushed stone/sand and gravel districts

0 — 100 Kilometers

Source: Wyoming State Geological Survey/U.S. Geological Survey (2005)

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THE MINERAL INDUSTRY OF WYOMING

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Wyoming State Geological Survey, for collecting information on all nonfuel minerals.

In 2005, Wyoming's nonfuel raw mineral production was valued[1] at $1.3 billion, based upon annual U.S. Geological Survey (USGS) data. This was a $250 million, or nearly 24% increase from the State's total nonfuel mineral production value for 2004, which then was up $51 million (up 5%) from that of 2003. The State rose to 14th from 16th in rank among the 50 States in total nonfuel raw mineral production value and accounted for about 2.4% of the U.S. total value. Yet, per capita, the State ranked first in the Nation in the value of its mineral industry's nonfuel mineral production; with a population of 509,000, the value of production was about $2,550 per capita.

Soda ash was Wyoming's leading nonfuel mineral, by value, followed by bentonite, Grade-A helium, construction sand and gravel, and portland cement. Together, the five accounted for nearly 96% of the State's total nonfuel raw mineral production value. In 2005, the mineral commodities with the largest increases in value were soda ash, bentonite clay, and construction sand and gravel; the unit values of each also increased, especially that of soda ash. A small increase in soda ash production led to a more than $180 million rise in its value. Larger increases in the production of bentonite and construction sand and gravel, relative to that of soda ash, resulted in increases in the two commodities values of $39 million and more than $12 million, respectively. Smaller yet significant increases took place in the values of crushed stone, crude gypsum, and lime. Although production of portland cement was down more than 10%, its value was up slightly. The largest decrease in value took place in Grade-A helium, down about $3 million.

In 2005, Wyoming continued to be first in rank in the quantities of soda ash and bentonite clay produced, and second in Grade-A helium production. Wyoming also continued to be a producer of significant quantities of construction sand and gravel and gypsum. The United States is the world's second leading producer of soda ash, which is produced mainly from trona ore. Wyoming was one of only three soda ash-producing States and is home to the world's largest known deposit of trona. Soda ash (sodium carbonate) is an inorganic chemical that is used extensively in the manufacture of glass, paper, soap and detergents, and textiles, and, in the form of sodium bicarbonate, in food products. California and Colorado produce significantly smaller quantities of natural soda ash.

[1]The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2005 USGS mineral production data published in this chapter are those available as of December 2006. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—can be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

The Wyoming State Geological Survey[2] (WSGS) provided the following narrative information. Production data in the text that follows are those reported by the WSGS and are based on the agency's own surveys and estimates. They may differ from production figures reported to the USGS.

Exploration and Development Activities

Industrial Minerals

Diamond.—Interest in diamond exploration in Wyoming increased during 2005 with inquiries by numerous companies concentrating on kimberlite districts and indicator mineral anomalies in the southeastern part of the State. Limited exploration for diamonds was reported in the Iron Mountain, State Line, Middle Sybille Creek, and Happy Jack-Eagle Rock Districts. A few kimberlites reportedly were discovered in the Happy Jack-Eagle Rock District west of Cheyenne, although these discoveries were not verified by the WSGS. Wyoming has essentially been unexplored for diamonds, although there exists significant potential for recovery of gem-quality diamonds from the State's underlain Archean rocks.

In a divergence from the trend of looking at known kimberlite districts and indicator mineral anomalies, one company expressed interest in the potential for unconventional diamond deposits hosted by lamprophyres and metakomatiites within the State.

Prospectors from Cody collected pyrope garnets (diamond indicator minerals) from a very large region in the Bighorn Basin west of Worland. The pyrope garnets were derived from anthills across an area covering several square kilometers.

Two companies proposed budgets to search for hidden olivine lamproites in the Leucite Hills, northeast of Rock Springs, aware that most olivine lamproite rock deposits throughout the world have yielded diamonds. The geologic characteristics of the Leucite Hills are very similar to Australia's Ellendale field, where both leucite-lamproites and hidden olivine-lamproites are found, and where commercial mining of olivine-lamproites for diamonds is carried out. Thus the occurrence of hidden olivine lamproites in the Leucite Hills was deemed a distinct possibility by the companies. Earlier, preliminary studies conducted by the WSGS on two lamproite deposits discovered in the northeastern edge of the Leucite Hills showed the presence of diamond-stability chromites. However, the first indication was that these chromite deposits were not likely to be highly mineralized in diamond.

[2]Wayne M. Sutherland, Assistant Staff Geologist; Bob Gregory, Geological Analyst; and W. Dan Hausel, Senior Economic Geologist; Natural Resources Division, Wyoming State Geological Survey, coauthored the text of the State mineral industry information.

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De Beers began development of an underground diamond mine at the Snap Lake kimberlite deposit in Northwest Territories, Canada. It was anticipated that the development of Snap Lake might serve to generate more interest in the Iron Mountain kimberlite deposit in Wyoming. Geochemical data for the Iron Mountain kimberlites suggest diamond potential similar to diamondiferous kimberlites in the State Line District to the south. Diamond-indicating pyropes were recovered from all Iron Mountain kimberlites sampled with the exception of a carbonatized dike in the southern portion of the district. One macro- and some micro-diamonds were recovered in the past from a small number of these kimberlites tested for diamond (Coopersmith and others, 2003, p. 7-11). The Snap Lake Mine is based on a diamondiferous kimberlite dike only 2.4-meters thick and is scheduled for full production in 2007 (AMEC plc, 2005; Hausel, 2005). In the past, several companies declined to explore the Iron Mountain diamondiferous kimberlites because they were of dike-type geologic formation. DeBeers showed that narrow dikes can be feasibly mined, even in the Arctic of Canada.

Gemstones.—The collection and marketing of precious and semiprecious gemstones as well as unique geologic materials from Wyoming continued as a diverse and untracked small-scale activity. As in previous years, sale of these materials during 2005 by amateur collectors, prospectors, semiprofessionals, and professional dealers took place primarily at gem and mineral shows, in local jewelry and rock shops, and over the Internet. These mineral commodities included agates, iolite, jasper, kyanite, labradorite, nephrite jade, opal, quartz, ruby, sapphire, and satin spar. Kimberlite, lamproite, and other types of rock specimens also were sold under similar conditions.

A report released by the WSGS, addressing the geology of the Cedar Rim opal deposit in central Wyoming indicated that the deposit was dominated by significant amounts of common opal, accompanied by some fire opal. However, it showed only traces of precious opal. Only a very small part of the large deposit has been examined, but the report indicated there was potential for more fire opal and the possibility of hidden precious opal seams (Hausel and Sutherland, 2005). Opals collected by the WSGS weighed as much as 77,100 carats. Release of the WSGS report triggered a staking rush in the Beaver Rim area that made national news and swamped local U.S. Bureau of Land Management offices with claim applications. Opal hunters eventually filed more than 1,100 claims and attracted investors from as far away as Japan. Opal exploration activity in the Cedar Rim area continued throughout 2005, with one prospector reporting the discovery of high-quality fire opal at a shallow depth.

Minor activity by Colorado-based Eagle-Hawk Mining Company continued at both the Palmer Canyon and Grizzly Creek gemstone deposits. Faceted iolites from these deposits yielded several gemstones in the 15 to 20 carat size range. A large gem ruby recovered earlier in the year from the area was faceted into an 8.5-carat gemstone. Individual exposed masses of apparent gem-quality iolite observed in the area may exceed 100,000 carats in weight.

Metals

Copper.—Preliminary investigations were begun by two companies seeking copper-gold mineralization in the Sierra Madre and Hartville uplifts. The Ferris-Haggarty and Kurtz-Chatterton properties in the Sierra Madre were of specific interest.

Gold.—Exploration activity rose during 2005, with at least two companies, Quincy Gold Corporation, Toronto, Ontario, Canada, and Nevada-based Bald Mountain Mining Company, exploring the Lewiston District in the South Pass greenstone belt. A third company, St. Joe Minerals Ltd., Lakewood, CO, explored the South Pass-Atlantic City trend owing to its similarities to a recent major gold discovery in the Great Lakes area of the United States. Inquiries were also made regarding the gold occurrence at Oregon Buttes, which was proposed to have been derived from the South Pass greenstone belt in a buried area adjacent to the Continental Fault (Hausel, 1991, p. 2, 81-82). Hecla Mining Company, Coeur d' Alene, ID, intersected significant magnetic induced polarization anomalies in this area and drilled into a potential sulfide-bearing iron formation. Norwest Corporation, Salt Lake City, UT, explored and tested for gold at the Dickie Springs–Oregon Butte paleoplacer deposit. Georgia-based Encampment Resources LLC and a number of consultants investigated gold properties in both South Pass and in the Rattlesnake Hills.

Newmont Mining Corporation, Denver, CO, explored for gold at the Bear Lodge Mountains site in northeastern Wyoming. Barrick Gold Corporation, Toronto, Ontario, Canada, planned to initiate exploration at this site, as well as the nearby Mineral Hill area. The Bear Lodge alkalic complex contains several rare-earth metal and gold anomalies. Earlier exploratory drilling at Smith Ridge in the Bear Lodge Mountains identified a gold resource of about 5,200 kilograms (kg) (168,000 ounces).

Platinum-Group Metals and Nickel.—In addition to its investigation of several gold properties, Encampment Resources continued to explore for platinum-group metal and nickel resources in the southeastern area of the State. Drilling and trenching exploration methods were employed, which targeted deposits in the Mullen Creek and Lake Owen layered complexes. The company reported the intersection of several promising anomalies that exhibited appreciable thicknesses.

Commodity Review

Industrial Minerals

Production of industrial minerals generally increased during 2005 compared with that of 2004. Bentonite, construction aggregate, gypsum, and trona increases appeared to reflect increases in both the construction industry and in exploration for energy minerals.

Bentonite.—Wyoming continued to lead the Nation in the production of sodium bentonite during the year. End uses for bentonite production included approximately 26% for pet waste absorbent (kitty litter), 23% for foundry sand bonding agent,

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22% for drilling mud, 13% for binder in iron ore pelletizing, and 16% for other uses (Virta, 2007). Production of bentonite increased by approximately 2% more than that of 2004 to a level of nearly 4.19 million metric tons (Mt). Employment in the bentonite industry rose by approximately 10% compared with that of 2004 (Wyoming Mining Association, undated§[3]). However, the number of mills operating in Wyoming during 2005 remained unchanged from that of 2004.

Dimension Stone.—The only dimension stone quarry that operated in Wyoming during 2005 was Strid Marble & Granite's sandstone quarry at Rawlins. Strid produced a stone that was marketed as Wyoming Gray Sandstone. It was processed in Cheyenne along with other rock types from a variety of sources, including stone from Platte County quarries no longer in operation.

Gypsum.—Gypsum production was continued at Big Horn and Park Counties in the Big Horn Basin where mine-mouth plants produced wallboard. A third small quarry in Albany County produced gypsum for use as a retardant in the manufacture of cement.

Soda Ash and other Sodium Compounds.—Wyoming is the leading trona and natural soda ash producer in the world. Trona, a naturally occurring mineral, is processed to yield soda ash. Trona production in 2005 was approximately 4% higher than in 2004. The higher production resulted from increased demand in a tight market coupled with increased plant production efficiency. Producer data indicate that soda ash is the ninth most widely used chemical in the United States.

Trona mined in Wyoming during 2005 was processed into soda ash and other sodium chemicals at four plants operated by four companies west of Green River. Except for about 1.1 Mt produced using solution mining methods, all trona produced in Wyoming used conventional underground mining methods, including longwall and room and pillar techniques (Harris, 2005).

Mineral Fuels and Related Materials

Uranium.—The Smith Ranch-Highland operation in the southern Powder River Basin, Converse County, produced about 590,000 kg of yellowcake (U_3O_8) in 2005, a 5.2% increase compared with the 2004 production (Stauffenberg, 2005). That operation employs in-situ recovery from several well fields, along with a uranium extraction mill. Water and lixiviant are injected into uranium-bearing sandstones, where they dissolve uranium minerals, and are then pumped back to the surface. The uranium is extracted at the mill, and the water is recycled into the above-described process.

Wyoming hosts the largest uranium reserves in the United States. An estimated 165 million kilograms of U_3O_8 are considered to be recoverable at an assumed uranium price of $110.00 per kilogram. During the next few years, more in-situ operations are expected to begin or resume production in several Wyoming basins.

[3]A reference that includes a section mark (§) is found in the Internet Reference Cited section.

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TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN WYOMING[1, 2]

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral	2003		2004		2005	
	Quantity	Value	Quantity	Value	Quantity	Value
Clays:						
Bentonite	3,420	148,000	3,510	151,000	4,160	190,000
Common	25	55	49	107	53	128
Gemstones	NA	13	NA	13	NA	14
Sand and gravel, construction	8,290	36,400	10,200	40,100	11,700	52,400
Stone, crushed	5,020	22,600	6,300 r	35,300 r	7,370	41,800
Combined values of cement (portland), gypsum (crude), helium (Grade-A), lime, soda ash, zeolites (2004-05)	XX	792,000	XX	819,000	XX	1,010,000
Total	XX	999,000	XX	1,050,000 r	XX	1,300,000

rRevised. NA Not available. XX Not applicable.
[1]Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2]Data are rounded to no more than three significant digits; may not add to totals shown.

TABLE 2
WYOMING: CRUSHED STONE SOLD OR USED, BY KIND[1]

Kind	2004			2005		
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Number of quarries	Quantity (thousand metric tons)	Value (thousands)
Limestone[2]	10	2,620 r	$13,500 r	10	2,500	$12,500
Granite	1	W	W	1	W	W
Quartzite	--	--	--	1	9	44
Marble	1	W	W	1	W	W
Traprock	8	-- r	-- r	8	--	--
Volcanic cinder and scoria	1	27	145	2	1,100	5,280
Miscellaneous stone	1	1,430	7,510	1	1,560	8,240
Total	XX	6,300 r	35,300 r	XX	7,370	41,800

rRevised. W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes limestone-dolomite reported with no distinction between the two.

TABLE 3
WYOMING: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2005, BY USE[1]

(Thousand metric tons and thousand dollars)

Use	Quantity	Value
Construction:		
Coarse aggregate, graded, bituminous aggregate, coarse	W	W
Fine aggregate (-⅜ inch), stone sand, bituminous mix or seal	W	W
Coarse and fine aggregates, graded road base or subbase	W	W
Other construction materials	1	8
Unspecified:[2]		
Reported	7,230	41,100
Estimated	112	539
Total	7,340	41,600
Grand total	7,370	41,800

W Withheld to avoid disclosing company proprietary data; included in "Grand total."
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Reported and estimated production without a breakdown by end use.

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TABLE 4
WYOMING: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2005, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		Districts 2		Unspecified districts	
	Quantity	Value	Quantity	Value	Quantity	Value
Construction:						
Coarse aggregate, graded[2]	--	--	--	--	W	W
Fine aggregate (-⅜ inch)[3]	--	--	--	--	W	W
Coarse and fine aggregate[4]	--	--	--	--	W	W
Other construction materials	--	--	--	--	1	8
Unspecified:[5]						
Reported	11	53	5,660	32,800	1,560	8,240
Estimated	11	52	101	488	--	--
Total	22	105	5,760	33,300	1,580	8,430

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes bituminous aggregate (coarse).
[3]Includes stone sand, bituminous mix, or seal.
[4]Includes graded road base or subbase.
[5]Reported and estimated production without a breakdown by end use.

TABLE 5
WYOMING: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2005,
BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)[2]	933	$6,770	$7.26
Asphaltic concrete aggregates and other bituminous mixtures	820	6,930	8.45
Road base and coverings	4,310	17,400	4.05
Road and other stabilization (cement)	226	666	2.95
Fill	200	747	3.74
Snow and ice control	30	328	10.93
Other miscellaneous uses[3]	21	211	10.05
Unspecified:[3]			
Reported	2,080	5,600	2.69
Estimated	3,050	13,700	4.51
Total or average	11,700	52,400	4.49

[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.
[2]Includes plaster and gunite sands.
[3]Reported and estimated production without a breakdown by end use.

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TABLE 6
WYOMING: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2005,
BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		Unspecified districts	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregates (including concrete sand)[2]	465	3,640	468	3,130	--	--
Asphaltic concrete aggregates and other bituminous mixtures	581	4,930	239	2,000	--	--
Road base and coverings[3]	2,520	10,100	1,880	7,410	136	568
Fill	91	469	109	278	--	--
Other miscellaneous uses[4]	5	31	46	509	--	--
Unspecified:[5]						
Reported	164	562	556	2,410	1,360	2,630
Estimated	801	3,750	2,240	9,980	--	--
Total or average	4,630	23,500	5,540	25,700	1,500	3,200

-- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes plaster and gunite sands.

[3]Includes road and other stabilization (cement).

[4]Includes roofing granules and snow and ice control.

[5]Reported and estimated production without a breakdown by end use.

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MAP MINERAL SYMBOLS[1]

Abr	Abrasives
Abr	Abrasives plant
Ag	Silver
AgLime	Agricultural lime
Al	Aluminum plant
Au	Gold
B	Borates
Ba	Barite
Ba	Barite plant
BC	Ball clay
Be	Beryllium
Be	Beryllium plant
Bent	Bentonite
Br	Bromine
Br	Bromine plant
Bx	Bauxite
CaC	Calcium carbonate
Cd	Cadmium
Cem	Cement plant
Clay	Common clay
CS	Crushed stone
Cu	Copper
Cu	Copper plant
D-D	Dimension dolomite
D-G	Dimension granite
Dia	Diatomite
Dia	Diatomite plant
Diam	Diamond
D-L	Dimension limestone
D-M	Dimension marble
Do	Dolomite
D-Q	Dimension quartzite
DS	Dimension stone
DS	Dimension stone plant
D-Sd	Dimension sandstone
D-Sl	Dimension slate
D-Sp	Dimension soapstone
FA	Ferroalloys plant
FC	Fire clay
Fe	Iron
Fel	Feldspar
FePig	Iron oxide pigments
FePig	Iron oxide pigment plant
Ful	Fuller's earth
Gar	Garnet
Gem	Gemstones
Gil	Gilsonite
Gr	Graphite plant
Gr-s	Synthetic graphite plant
GS	Greensand
Gyp	Gypsum
Gyp	Gypsum plant
Gyp-s	Synthetic gypsum
He	Helium
I	Iodine
IS	Industrial sand
ISG	Industrial sand and gravel
Jd	Jade
K	Potash
Ka	Kaolin
Ky	Kyanite
Leo	Leonardite
Li	Lithium carbonate
Li	Lithium plant
Lime	Lime plant
Mg	Magnesium metal plant
MgCp	Magnesium compounds
Mica	Mica
Mica	Mica plant
Mn	Manganese dioxide plant
Mo	Molybdenum
Mo	Molybdenum plant
Mul	Synthetic mullite plant
Nabic	Sodium bicarbonate
NaC	Sodium carbonate
Nb/Ta	Columbium (niobium) and tantalum plant
Nsal	Natural salines (CaCl)
O	Olivine
Opal	Precious opal
P	Phosphate rock
Pb	Lead
Pb	Lead plant
Pd	Palladium
Peat	Peat
Per	Perlite
Per	Perlite plant
Pt	Platinum
Pum	Pumice and pumicite
Pyrp	Pyrophyllite
RE	Rare earths plants
RW	Rock wool
SA	Soda ash
SaCp	Saline compounds
Salt	Salt
SG	Construction sand and gravel
Sh	Shale
Shell	Shell
Si	Silicon metal plant
Slag	Slag
S-ng	Sulfur (natural gas)
S-o	Sulfur (oil)
SS	Sodium sulfate
Steel	Steel plant
Talc	Talc
Ti	Titanium minerals
TiMet	Titanium metal plant
TiPig	Titanium dioxide pigment plant
Trip	Tripoli
V	Vanadium
V	Vanadium plant
Vm	Vermiculite
Vm	Vermiculite plant

[1]The maps in this report are intended to show by mineral symbols the location of significant nonfuel mineral mining or processing operations within each State in 2005. (An underlined symbol indicates a plant.) The symbols are not intended to show the location of every mine, quarry, and operation. Because there are about 13,000 nonfuel mineral operations in the United States, publication space limitations preclude the inclusion of a clear and legible map indicating all active operations. The U.S. Geological Survey's National Atlas, however, provides such data on the Internet at URL http://www.nationalatlas.gov. In most cases, a mineral symbol represents production of a significant quantity of a mineral. A symbol can indicate the location of a major mineral mining or processing operation, the location of a concentration of mining operations for a specific mineral, or the location of significant operations within a county. In some cases, however, a symbol may indicate a small operation that is significant because the mineral is uncommon or unique within the State or the Nation. Where there is an extensive geographic area with a significant concentration of similar operations, a dashed line defines the area.

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Volc	Volcanic cinder	Zn	Zinc
Wol	Wollastonite	Zr	Zirconium
Zeo	Zeolites	Zr	Zirconium plant

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